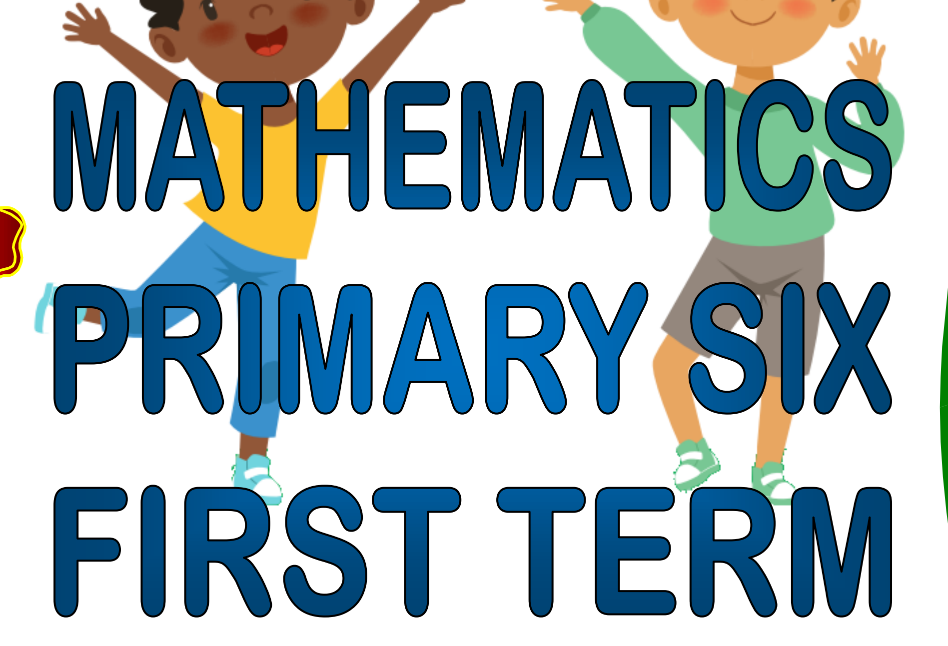


MATHEMATICS
PRIMARY SIX
FIRST TERM







Theme (1) | Number Sense and Operations Expressions and Equations

Unit (1) | Division, Factors, and Multiples

Concept (1) | Use Standard Algorithm for Division, Solve Problems with GCF and LCM

Unit (2) | Rational Numbers

Concept (1) | Explore the Number Line

Concept (2) | Investigating Rational Numbers

Concept (3) | Interpret and Use Absolute Value

Unit (3) | Algebraic Expressions

Concept (1) | Use and Analyze Expressions

Concept (2) | Algebraic Expressions and Exponents

Unit (4) | Equations and Inequalities

Concept (1) | Write and Solve Equations and Inequalities

Theme (2) | Mathematical Operations and Algebraic Thinking Statistics and Data Analysis

Unit (5) | Dependent and Independent Variables

Concept (1) | Explore Relationships between Two Variables

Unit (6) | Data Distributions

Concept (1) | Applications on Collecting and Represent Data

Unit (7) | Measures of Center and Variation

Concept (1) | Exploring central tendency measurements and Dispersion






UNIT 1

Theme 1 | Number Sense and Operations: Expressions and Equations

Division, Factors, and Multiples

Concept (1)

Lesson (1) Divisibility

🔔 REMEMBER:

The Even numbers are: 0, 2, 4, 6, 8, 10, 12, 14, 16, ...
The odd numbers are: 1, 3, 5, 7, 9, 11, 13, 15, 17, ...

Divisibility

If the remainder of division is 0, then the dividend is divisible by the divisor.
If the remainder is not 0, then the dividend is not divisible by the divisor.

For example:

$12 \div 4 = 3$ R 0, then 12 is divisible by 4
$14 \div 4 = 3$ R 2, then 14 is not divisible by 4



Divisibility by 2

Any number is divisible by 2 if its ones digit is (0, 2, 4, 6 or 8) (even number).
All even numbers are divisible by 2.



Example (1): Circle the numbers that are divisible by 2:

2,467	68,745	1,934	4,209	2,518	2,000
9,172	126	7,932	4,247	23,104	257,193
14,980	714,501	21,567	35,952	2,000,000	421,641
2,468,104	536,208	721,605	52,107	201,102	611,206



Divisibility by 5

Any number is divisible by 5 if its ones digit is (0 or 5).



Example (2): Circle the numbers that are divisible by 5:

1,240	21,456	35,105	2,653	29,681	461,100
3,000,000	503,204	500,000	300,207	520,559	36,450
2,000	4,509	35,105	25,009	50,006	150,150
555,554	50,400	55,555	20,102	65,100	200,105



Divisibility by 10

Any number is divisible by 5 if its ones digit is (0).



Example (3): Circle the numbers that are divisible by 10:

2,400	25,105	34,500	21,455	65,801	50,000
1,000,000	20,006	24,120	653,280	987,320	45,010
5,005	21,000	5,400	2,000,007	21,409	63,080
941,290	45,162	21,590	24,8970	45,009	6,007



Divisibility by 3

Any number is divisible by 3 if the sum of its digits is divisible by 3. (3, 6 or 9)



Example (4): Circle the numbers that are divisible by 3:

45	36	222	456
154	777	364	554
1,002	12,748	558	652
100	58	10,002	3,069



Divisibility by 4

Any number is divisible by 4 if its ones and tens are divisible by 4.



Example (5): Circle the numbers that are divisible by 4:

2,132	3,151	208	307	7,912	3,536
25,140	729,104	39,503	34,216	49,214	32,100
21,206	9,120	35,250	101	352	2005
401,520	91,312	25,109	53,624	11,136	21,706



Divisibility by 6

Any number is divisible by 6 if it is divisible by 2 and 3 together.



Example (6): Circle the numbers that are divisible by 6:

21,202	35,501	31,204	51,702	111,111	222,222
210,102	301,203	3,000,000	245,502	61,500	600,000
900	40,001	70,002	36,402	21,210	45,456
23,232	43,434	37,373	21,211	44,444	66,666



[1] Choose the correct answer:

(1) 244 is divisible by ……
a 2 b 3 c 5 d 6

(2) 350 is divisible by ……
a 2 b 5 c 10 d all of them

(3) 342 is divisible by ……
a 2 b 3 c 6 d all of them

(4) 325 is divisible by ……
a 2 b 3 c 5 d 10

Homework

[1] Choose the correct answer:

(1) 26 is divisible by ......
ⓐ 2 ⓑ 3 ⓒ 5 ⓓ 6

(2) ...... is divisible by 3
ⓐ 133 ⓑ 236 ⓒ 213 ⓓ 304

(3) 7,205 is divisible by ......
ⓐ 2 ⓑ 3 ⓒ 4 ⓓ 5

(4) ...... is divisible by 5
ⓐ 50,502 ⓑ 978,210 ⓒ 26,413 ⓓ 243

(5) ...... is divisible by 3
ⓐ 222 ⓑ 34,231 ⓒ 25,450 ⓓ 250

(6) ...... is divisible by 10
ⓐ 50,502 ⓑ 978,210 ⓒ 26,493 ⓓ 2,004

(7) ...... is divisible by 2 and 5
ⓐ 51,702 ⓑ 51,215 ⓒ 26,410 ⓓ 235

(8) ...... is divisible by 6
ⓐ 6,201 ⓑ 303,210 ⓒ 27,412 ⓓ 217

(9) ...... is divisible by 3 and 5
ⓐ 6,120 ⓑ 978,211 ⓒ 20,005 ⓓ 291

(10) ...... is not divisible by 5
ⓐ 50,500 ⓑ 978,210 ⓒ 26,413 ⓓ 25

(11) ...... is not divisible by 2
ⓐ 50,502 ⓑ 978,210 ⓒ 26,413 ⓓ 24

(12) ...... is not divisible by 10
ⓐ 50,500 ⓑ 978,211 ⓒ 26,410 ⓓ 200

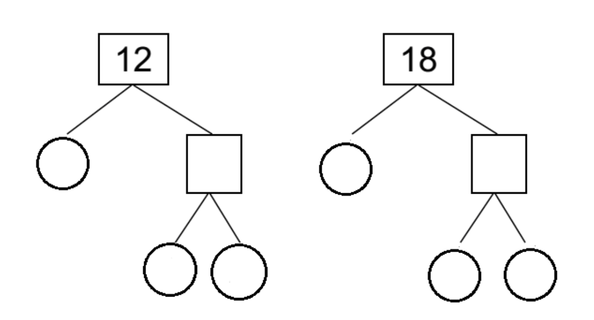
(13) All even numbers are divisible by ......
ⓐ 2 ⓑ 3 ⓒ 5 ⓓ 10



Lesson (2) Factorizing a Number to Its Prime Factors

[1] Find the GCF and LCM of the two numbers 12 and 18 using Venn diagram:

Venn diagram



Common factors

Prime Factors of 12

Prime Factors of 18

12 = ... × ...... × ......

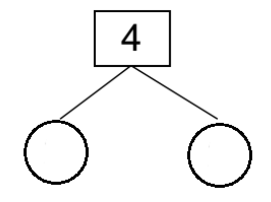
18 = ... × ...... × ......

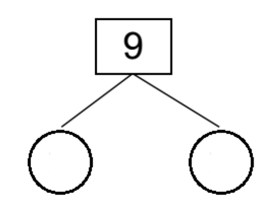
GCF = ...

LCM = ...

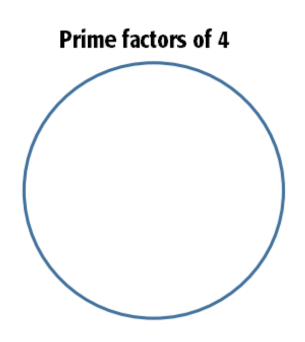


[2] Find the GCF and LCM of the two numbers 4 and 9 using Venn diagram:

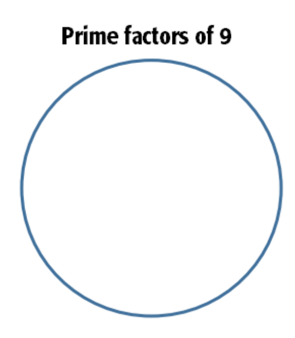




Prime factors of 4



Prime factors of 9



4 = ... × ......

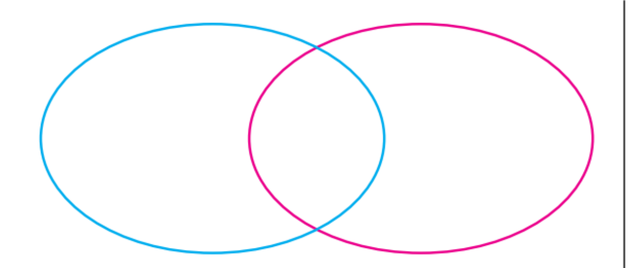
9 = × ...... × ......

GCF = ...

LCM = ...



[3] Find the GCF and LCM of the two numbers 16 and 20 using Venn diagram:



GCF = ...

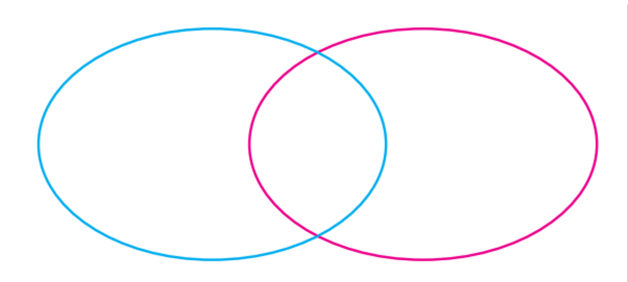
LCM = ...

16 = ...

20 = ...



[4] Find the GCF and LCM of the two numbers 24 and 36 using Venn diagram:



GCF = ...

LCM = ...

24 = ...

36 = ...



Definition:

Relatively Prime Numbers: are numbers whose only common factor is 1.



Remarks:

[1] The common factor of all numbers is 1.

[2] The common Multiple of all numbers (except zero) is zero.

[3] The LCM for any relatively prime numbers is their product.





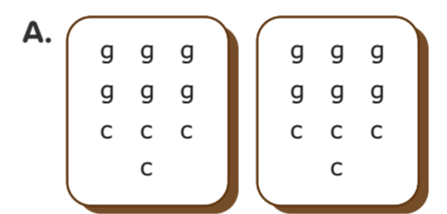

[3] For two relatively prime numbers, which of the following is true?

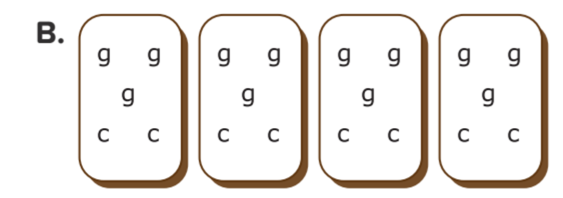
		Yes	No
(1)	If there is no common factors in the intersection, the GCF is 0		
(2)	If there is no common factors in the intersection, the GCF is 1		
(3)	The LCM is the product of the two numbers		
(4)	The LCM is the product of all prime factors in the Venn diagram		

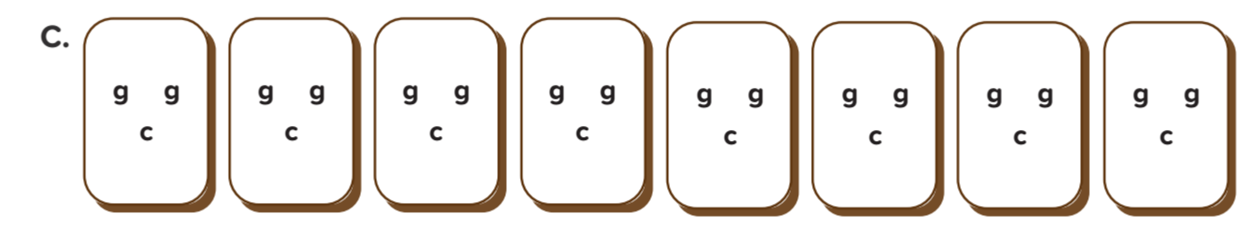


Lesson (3) Writing Expressions Using the GCF

[1] Ahmed has collected 12 grain bags and 8 packs of cheese in order to make donation boxes for the needy. Help Ahmed to determine the greatest number of boxes he could make so that all boxes include the same number of items. Let g stand for grain bag and c stand for a pack of cheese. You can represent this information with an expression.

A.


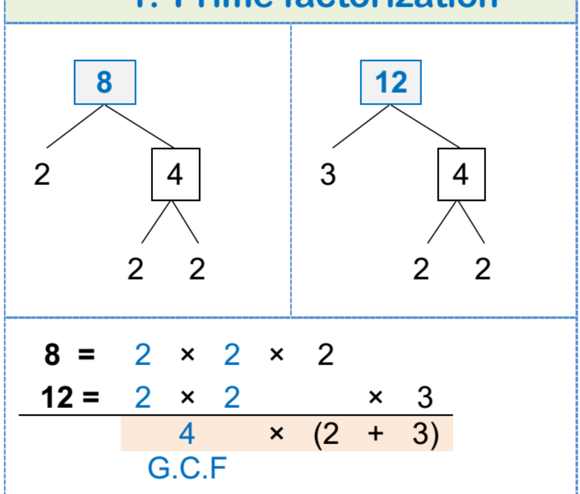
B.


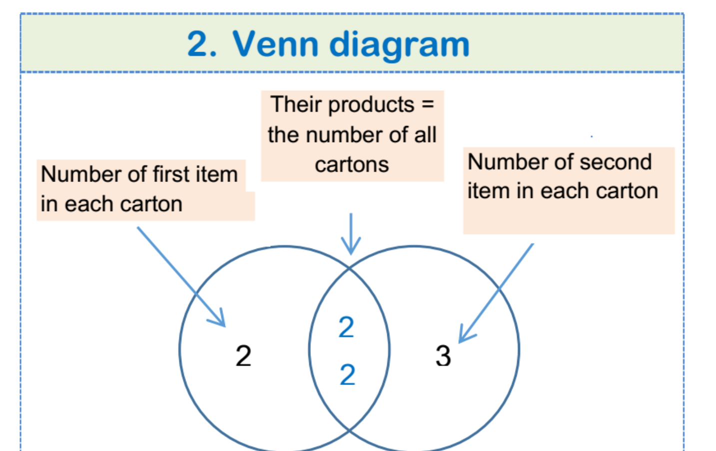
C.


Which expression represents the total number of items that Ahmed put into his boxes? Identify all that apply.

a. $4 + 3 + 2$ b. $(4\times3) + (4\times2)$ c. $4\times(3+2)$ d. $4 + (3\times2)$









[2] **Students have collected 36 packs of cheese and 48 grain bags to make baskets. What is the largest number of baskets can be prepared with no items left over? And each basket will have the same number of packs of cheese and the same number of grain bags.**

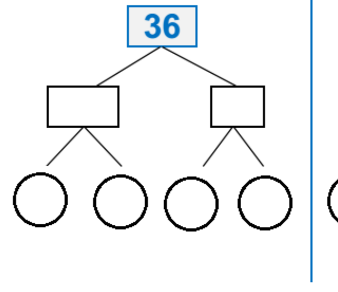
Sol:

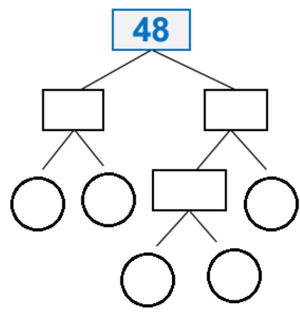
36 = × × ×

48 = × × × ×

= × (+)

= (×) + (+)







[1] **Ali has 48 pencils and 18 crayons. What is the numerical expression of the greatest number of sets that can be formed so that all sets have the same number of items?**

....

....

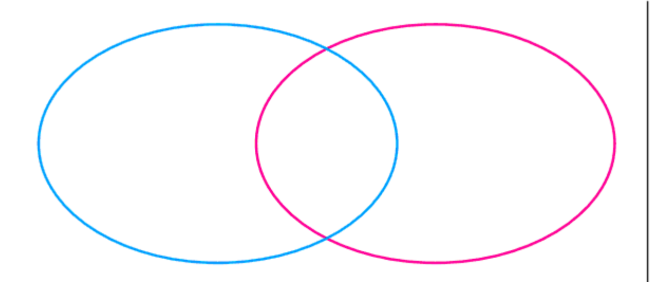
....

....



[2] Find the GCF and LCM for each pair of numbers using Venn diagram

a. 18 and 24



GCF = ...

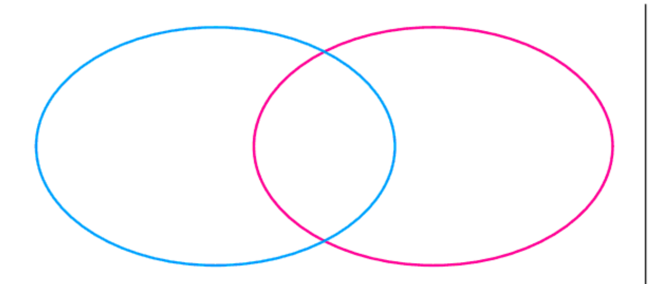
LCM = ...

18 = ...

24 = ...



b. 20 and 30



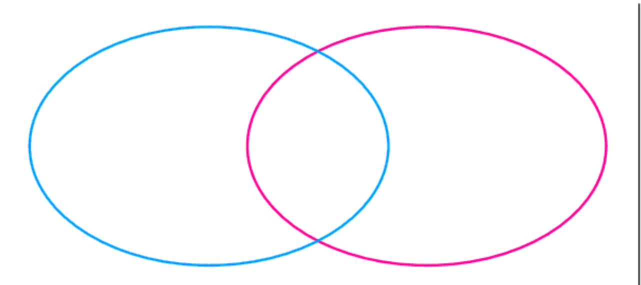
GCF = ...

LCM = ...

20 = ...

30 = ...

c. 6 and 15



GCF = ...

LCM = ...

6 = ...

15 = ...

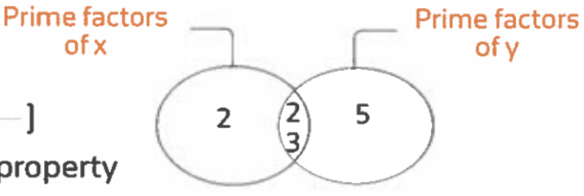
From the opposite Venn diagram

x = ...

y = ...

The expression : .... (............ + ...)

represent the sum of x and y using distributive property

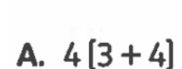




From the opposite Venn diagram represent the prime factors of two number.

The expression that represent the addition of two number is ....

3 | 2, 2



A. 4 (3 + 4) B. 3 (4 + 1) C. 4 (3 + 1) D. 3 (2 + 2)



5 (2 + ...) = 10 + 35

A. 5 B. 7 C. 2 D. 8



9 (1 + 2) = 9 + ...

A. 9 B. 81 C. 18 D. 27



In the opposite Venn diagram the L.C.M is ....

A. 0 B. 1 C. 15 D. 8



Which of the following are relatively prime numbers ? ....

A. 4 and 8 B. 12 and 18 C. 2 and 12 D. 9 and 4



In the opposite venn diagram the G.C.F is ....

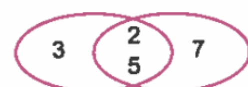
3 | 2 | 5



From the opposite Venn diagram , the expression is ....

A. 10 (6 + 35) B. 3 (10 + 7)

C. 7 (10 + 3) D. 10 (3 + 7)



Lesson (4) Analyzing least Common Multiples

[1] Find the result:

(1) $1 + \frac{2}{9} =$ ....

(2) $\frac{1}{5} + \frac{4}{5} =$ ....

(3) $\frac{3}{11} + \frac{7}{11} =$ ....

(4) $\frac{3}{5} + \frac{1}{5} =$ ....

(5) $\frac{2}{7} + \frac{6}{7} =$ ....

(6) $2\frac{3}{8} + 1\frac{7}{8} =$ ....

(7) $\frac{6}{11} + \frac{6}{11} =$ ....

(8) $\frac{1}{4} + \frac{2}{4} =$ ....

(9) $\frac{7}{8} - \frac{3}{8} =$ ....

(10) $\frac{3}{5} - \frac{1}{5} =$ ....

(11) $3\frac{5}{6} - 1\frac{1}{6} =$ ....

(12) $3 - \frac{3}{4} =$ ....

(13) $5\frac{3}{7} - \frac{6}{7} =$ ....

(14) $5 - 1\frac{2}{7} =$ ....

(15) $5\frac{2}{5} - 1\frac{4}{5} =$ ....

(16) $1 - \frac{3}{5} =$ ....

(17) $\frac{1}{8} + \frac{1}{5} =$ ....

(18) $\frac{3}{7} + \frac{2}{5} =$ ....

(19) $2\frac{1}{3} + 1\frac{1}{2} =$ ....

(20) $\frac{1}{4} + \frac{1}{12} =$ ....

(21) $1\frac{3}{5} + \frac{1}{3} =$ ....

(22) $\frac{7}{10} + \frac{5}{6} =$ ....

(23) $\frac{3}{4} + \frac{4}{5} =$ ....

(24) $\frac{1}{4} + \frac{2}{3} =$ ....

(25) $\frac{5}{6} - \frac{3}{8} =$ ....

(26) $\frac{1}{4} - \frac{1}{5} =$ ....

(27) $1\frac{1}{12} - \frac{5}{9} =$ ....

(28) $\frac{5}{6} - \frac{1}{2} =$ ....

(29) $\frac{5}{6} - \frac{7}{12} =$ ....

(30) $6\frac{4}{5} - 2\frac{1}{4} =$ ....

(31) $\frac{3}{4} - \frac{2}{3} =$ ....

(32) $\frac{5}{7} - \frac{2}{3} =$ ....



Homework

[1] Choose the correct answer:

(14) $\frac{5}{6} - \frac{3}{5} =$ ....

ⓐ $\frac{7}{30}$ ⓑ $\frac{8}{30}$ ⓒ $\frac{9}{30}$ ⓓ $\frac{1}{3}$

(15) The equivalent fraction to $\frac{12}{15}$ is ....

ⓐ $\frac{2}{5}$ ⓑ $\frac{3}{4}$ ⓒ $\frac{4}{5}$ ⓓ $\frac{1}{3}$

(16) $\frac{5}{8}$ + ... = 1

ⓐ $\frac{1}{8}$ ⓑ $\frac{3}{8}$ ⓒ $\frac{5}{8}$ ⓓ $\frac{7}{8}$

(17) $2\frac{3}{4} + 1\frac{2}{3} =$ ....

ⓐ $3\frac{5}{12}$ ⓑ $4\frac{5}{12}$ ⓒ $\frac{17}{12}$ ⓓ 4

(18) A student has collected 20 packs of cheese and 40 grain bags to make food boxes. He uses the expression 10(2 + 4) to represent how many boxes he could make with equal amounts of food in each box. His friend tells him that there is another way to make more boxes. Which one is correct?

ⓐ 20 (2 + 4) ⓑ 10 (1 + 2) ⓒ 10 (1 + 4) ⓓ 20 (1 + 2)





Unit (1) Assessment

[1] Choose the correct answer:

(1) If 384 ÷ 16 = 24, then the dividend is ....

a) 384 b) 16 c) 24 d) 0

(2) If 40 ÷ 5 = 8, then the remainder is ....

a) 40 b) 5 c) 8 d) 0

(3) If 29 ÷ 3 = 9 R2, then the divisor is ....

a) 29 b) 3 c) 9 d) 2

(4) The GCF of 6 and 8 is ....

a) 1 b) 2 c) 3 d) 4

(5) The common factor of all numbers is ....

a) 0 b) 1 c) 2 d) 3

(6) The GCF of any two relatively prime numbers is ....

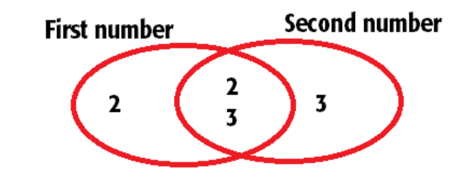
a) 0 b) 1 c) 2 d) 3

(7) The common multiple of all numbers (except zero) is ....

a) 0 b) 1 c) 2 d) 3



[2] From the opposite Venn diagram, Complete:



(1) The GCF of the two numbers is ....

(2) The LCM of the two numbers is ....

(3) The first number is ....

(4) The second number is ....



[3] Essay Problems:

(1) Salma bought $3\frac{1}{2}$ kg of tomatoes and $1\frac{1}{4}$ kg of onions. How many kilograms of vegetables did she buy?

....

(2) Ali bought a bottle of juice contains $1\frac{1}{2}$ liters. He drank $\frac{2}{5}$ Liters. How many liters of juice were left?

....







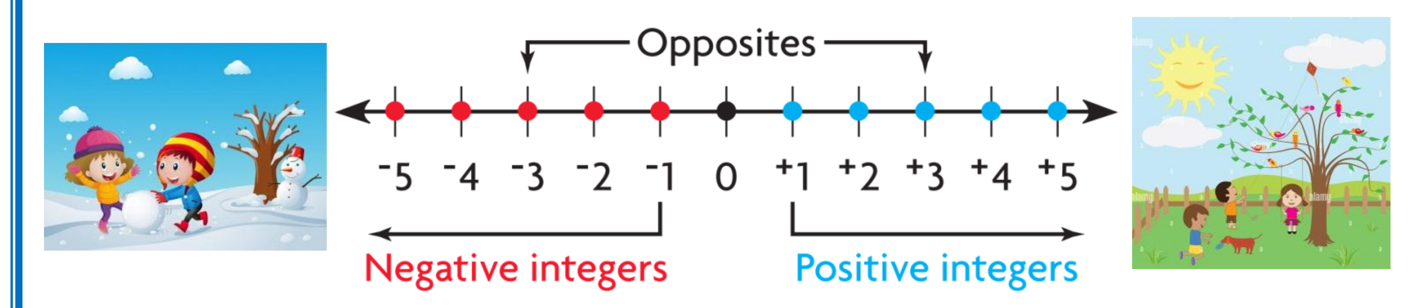
UNIT 2

Theme 1 | Number Sense and Operations: Expressions and Equations

Rational Numbers

Concept (1)

Lesson (1) Using a Number Line to Describe Data



Integers are the set of all whole numbers and their opposites. Two numbers are **opposite** if they are the same distance from 0 on the number line on different sides of 0. For example, the integers **+3** and **-3** are opposites. **Zero** is its **own opposites**.



[1] Graph each integer and its opposite on a number line:

A 2

The integer 2 is on the _______ side of 0.

Graph the opposite of 2 at _______.



So, the opposite of 2°C is _______.

B −4

The integer ⁻4 is on the _______ side of 0.

Graph the opposite of ⁻4 at _______.



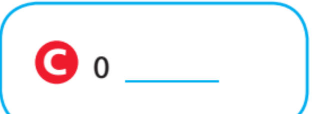
So, the opposite of ⁻4°C is _______.



[2] Write the opposite of the integer:









[3] Represent the following data on the number line, then order them from lowest to highest:

	Liquid	Freezing Point (°C)
A	Corn Oil	-20
E	Fresh Water	0
M	Sea Water	-2
D	Peanut Oil	3
H	Orange Juice	-6

Lowest	⟶	⟶	⟶	Highest



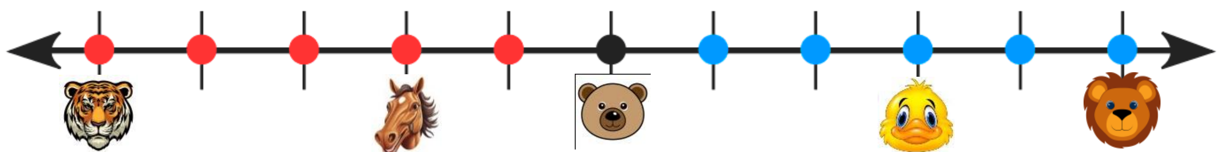
[4] Write an integer number to represent each situation:

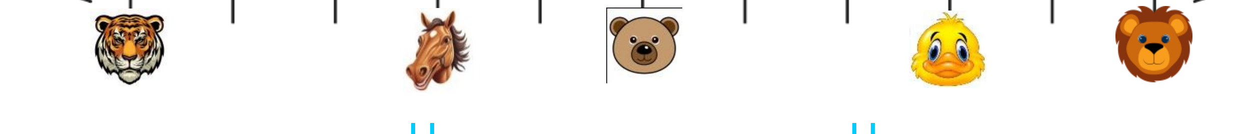
(1) A tree is 4 m tall. (..................)
(2) A bank deposit of L.E. 700 (..................)
(3) Ali withdraws 500 pounds from his bank accountant. (..................)
(4) A loss of L.E. 2000 (..................)
(5) A profit of L.E. 5000 (..................)
(6) A gain of 8 points. (..................)
(7) A temperature is 5 °C above zero. (..................)
(8) A temperature is 4 °C below zero. (..................)
(9) 50 m above sea level. (..................)
(10) 13 m below sea level. (..................)
(11) He is diving 3 m deep. (..................)
(12) A weight loss of 3 kg. (..................)
(13) A decrease of L.E. 600 (..................)
(14) An increase of L.E. 900 (..................)
(15) 3 steps forward. (..................)
(16) 5 steps backward. (..................)

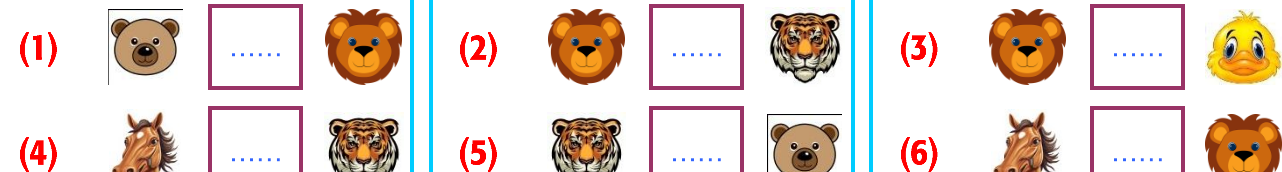


Lesson (2) Using a Number Line and Symbols to Compare Numbers

[1] Look at the following number line, then complete using (<) or (>):

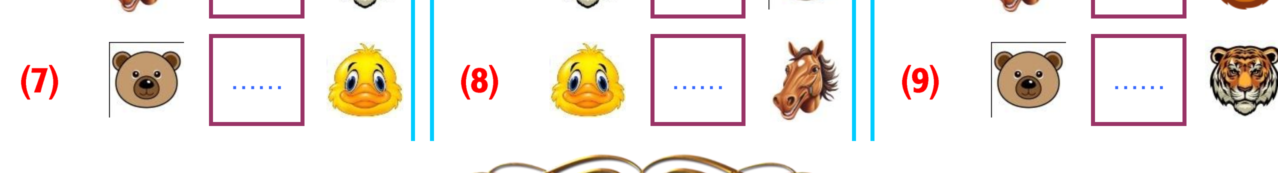






(1) ...... (2) ...... (3) ......

(4) ...... (5) ...... (6) ......



(7) ...... (8) ...... (9) ......



[2] Complete using (<) or (>):

(1)	-5	......	0	(2)	25	......	-15	(3)	60	......	40
(4)	12	......	10	(5)	4	......	-5	(6)	19	......	18
(7)	-6	......	-3	(8)	75	......	90	(9)	-3	......	-2
(10)	83	......	59	(11)	-41	......	43	(12)	87	......	-87



[3] Order each set of integers from least to greatest:

(1)	14	2	11	8	9	......	......	......	......	......
(2)	-50	167	-240	34	95	......	......	......	......	......
(3)	-68	-113	2	89	-90	......	......	......	......	......
(4)	7	80	-5	2	100	......	......	......	......	......
(5)	-90	9	16	25	-900	......	......	......	......	......





[4] Complete:

(1) The Greatest negative integer is ....

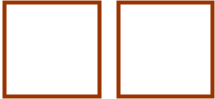
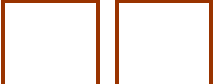
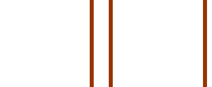
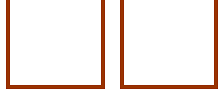
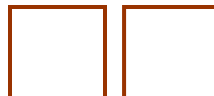
(2) The smallest positive integer is ....

(3) The smallest non-negative integer is ....

(4) The greatest non-positive integer is ....



[5] Tick (✓) under Yes or No:

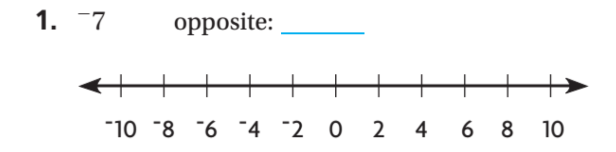
		Yes	No
(1)	A number and its opposite are the same distance away from zero on a number line but on opposite sides.		
(2)	All opposites are negative numbers.		
(3)	Zero is its own opposite.		
(4)	To show 5 and its opposite on a number line, count 5 units and plot the point 5 units to the right and to the left of 0.		
(5)	The opposite of an opposite is zero.		



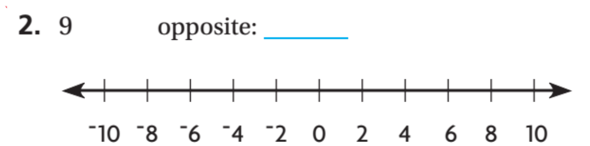
Homework

[1] Graph the integer and its opposite on a number line:

1. $^{-}7$ opposite: ______



2. 9 opposite: ______



[2] Write the opposite of each given number:

1. $-5 \longrightarrow$ ....
2. $6 \longrightarrow$ ....
3. $\frac{1}{2} \longrightarrow$ ....
4. $-16 \longrightarrow$ ....
5. $-\frac{3}{2} \longrightarrow$ ....
6. $-1 \longrightarrow$ ....



[3] Complete using (<), (>) or (=):

(1)	-80	......	80	(2)	6	......	5	(3)	-99	......	7
(4)	-8	......	0	(5)	-202	......	-252	(6)	12	......	8
(7)	-25	......	-20	(8)	75	......	85	(9)	4	......	-86

[4] Order each set of integers from least to greatest:

(1)	54	52	-2	-8	91	......	......	......	......	......
(2)	-70	22	-80	34	-96	......	......	......	......	......
(3)	-4	-13	2	-9	-30	......	......	......	......	......



[5] Complete the table :

	Previous	Number	Next		Previous	Number	Next
(1)	......	-7	......	(2)	......	7	......
(3)	......	0	......	(4)	......	-22	......
(5)	......	-20	......	(6)	......	85	......
(7)	......	5	......	(8)	......	-60	......
(9)	......	-4	......	(10)	......	45	......

[6] Write the next four integers:

(1)	12	......	......	......	......
(2)	-50	......	......	......	......
(3)	-68	......	......	......	......
(4)	7	......	......	......	......

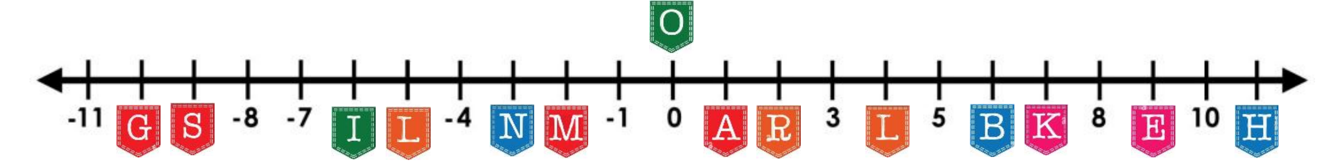


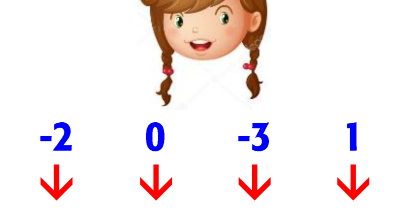
[7] Write the previous four integers:

(1)	......	......	......	......	12
(2)	......	......	......	......	-50
(3)	......	......	......	......	-68
(4)	......	......	......	......	7



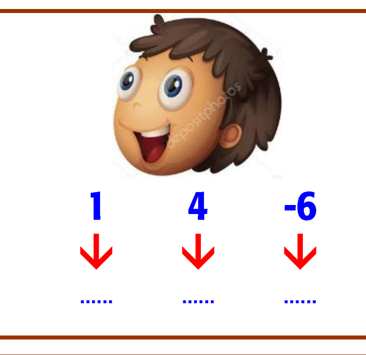
[8] Write the letter that represents each number to discover the name of each child:





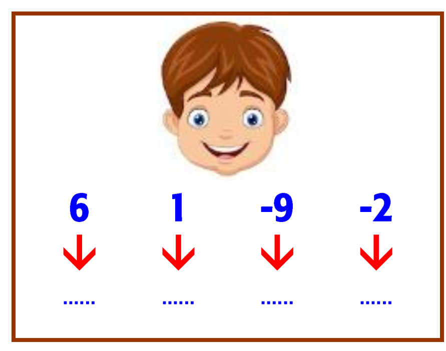
-2 0 -3 1

....



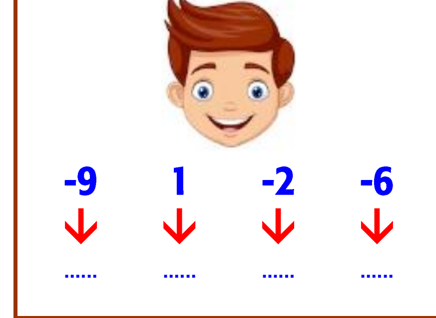
1 4 -6

....



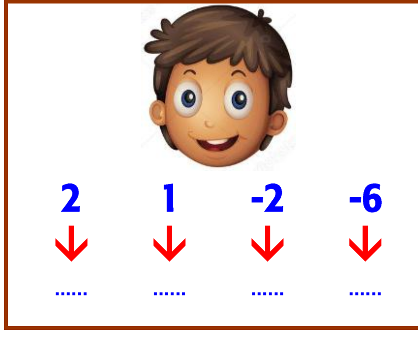
6 1 -9 -2

....



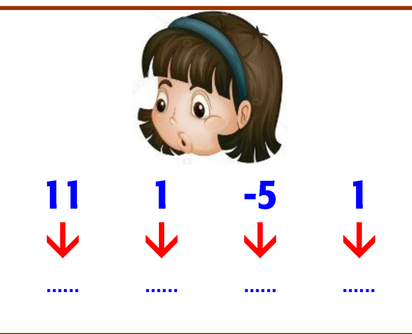
-9 1 -2 -6

....



2 1 -2 -6

....



11 1 -5 1

....

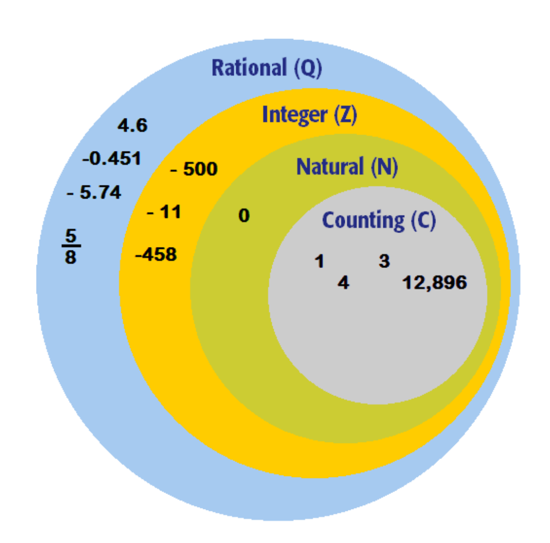


Concept (2)

Lesson (3) Analyzing Rational Numbers by Using Models

[1] Place the following numbers into the opposite diagram where you think they fit best.

0.5	-7,605
-951	-5.47
78	822
$\frac{5}{11}$	$-3\frac{1}{4}$





[2] Match the numbers to the best description:

Rational numbers	Integer numbers	Counting numbers	Natural numbers

1. 0.585	2. -0.606	3. $\frac{1}{2}$ ....
4. 4	5. $6\frac{2}{3}$	6. 1 ....
7. -455	8. -11	9. 12,800 ....
10. 0	11. -28,765	12. 4.9 ....



[3] Tick (✓) under Yes or No:

	Yes	No
(1) All integer numbers are also natural numbers.		
(2) All natural numbers are also rational numbers.		
(3) All rational numbers are also integer numbers.		
(4) All natural numbers are also counting numbers.		
(5) All integer numbers are also rational numbers.		
(6) All rational numbers are also natural numbers.		



Remarks:

• $0.25 = \frac{1}{4}$	• $0.5 = \frac{1}{2}$	• $0.75 = \frac{3}{4}$	• $0.125 = \frac{1}{8}$
• $0.2 = \frac{1}{5}$	• $0.4 = \frac{2}{5}$	• $0.6 = \frac{3}{5}$	• $0.8 = \frac{4}{5}$

[4] Write the given rational numbers in fraction form $\frac{a}{b}$:

1. 4 ⟶ .... 2. 0.75 ⟶ .... 3. - 45 ⟶ ....

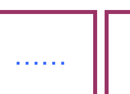
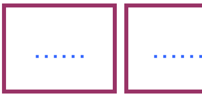
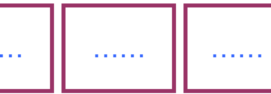
4. - 1.5 ⟶ .... 5. - 2.5 ⟶ .... 6. 0.125 ⟶ ....

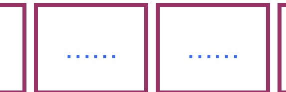


Lesson (4) Comparing and Ordering Rational Numbers

[1] Order the given set of numbers from least to greatest:

(1)	2.1	1.4	$-3\frac{1}{4}$	$-1\frac{7}{8}$	$-2\frac{1}{2}$	......	......	......	......	......
(2)	3.7	$-3\frac{3}{5}$	$-4\frac{1}{3}$	0	$-5\frac{1}{2}$	......	......	......	......	......
(3)	$-7\frac{1}{5}$	4	$-9\frac{3}{8}$	$-2\frac{1}{3}$	2	......	......	......	......	......





[2] Write a number that is between each pair of numbers:

A. 3.75 and 3.76 ....

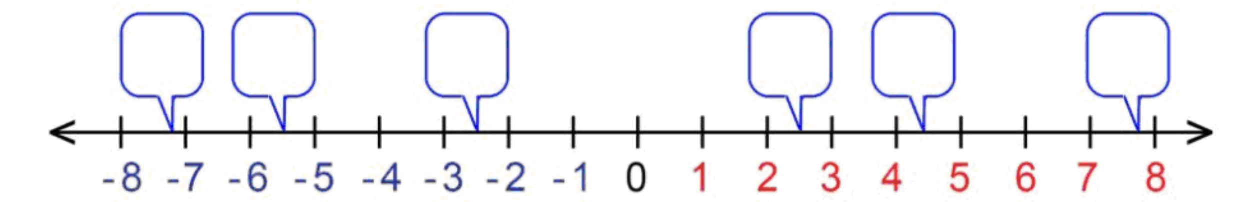
B. -9.1 and -9 ....

C. $\frac{1}{9}$ and $\frac{2}{9}$ ....

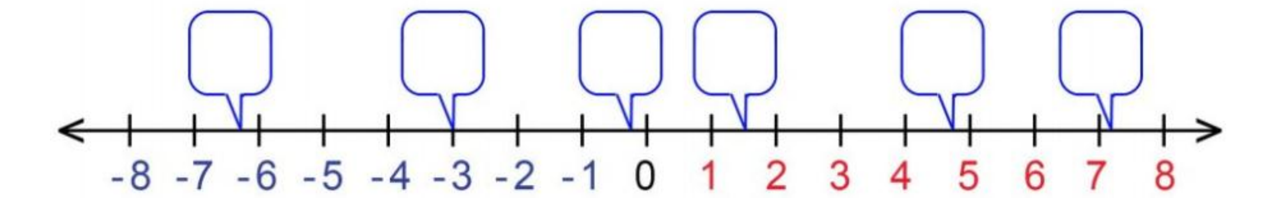
D. $-\frac{3}{4}$ and $-\frac{1}{2}$ ....

[3] Put each number in its suitable place on the number line:

(1) $4\frac{1}{2}$ 2.5 $-2\frac{1}{3}$ -7.25 -5.5 $7\frac{3}{4}$



(2) -3 1.5 $\frac{-3}{8}$ $-6\frac{1}{4}$ $4\frac{2}{3}$ 7.2





[4] Choose the correct answer:

(1) The represented number on the opposite number line is ....

-8 -7 -6 -5 -4 -3

a $4\frac{2}{3}$ b $5\frac{2}{3}$ c $-4\frac{2}{3}$ d $-5\frac{2}{3}$

(2) The represented number on the opposite number line is ....

-3 -2 -1 0 1 2 3

a 0.5 b 1.5 c -0.5 d -1.5





Homework

[1] Choose the correct answer:

(1) The represented number on the opposite number line is ....

-8 -7 -6 -5 -4 -3

ⓐ $4\frac{1}{2}$ ⓑ $5\frac{1}{2}$ ⓒ $-5\frac{1}{3}$ ⓓ $-4\frac{5}{6}$

(2) The number (-2) is .... number.

ⓐ a natural ⓑ a counting ⓒ an odd ⓓ an integer

(3) All integer numbers are .... numbers.

ⓐ a natural ⓑ a counting ⓒ an even ⓓ a rational

(4) The opposite of the number (-5) is ....

ⓐ 5 ⓑ -5 ⓒ $\frac{1}{5}$ ⓓ $\frac{-1}{5}$

(5) The rational number $-2\frac{2}{3}$ lies between the two integers .... and ....

ⓐ 2 , 3 ⓑ 1 , 2 ⓒ -2 , -3 ⓓ -1 , -2



[2] Complete:

(1) The additive inverse of 5.9 is ....

(2) The rational number -5.6 lies between the two integers .... and ....

(3) All natural numbers are .... numbers and .... numbers.

(4) The number -2.5 = ... (in the form $\frac{a}{b}$).

(5) The rational number $-2\frac{1}{4}$ = ... (in the decimal form).



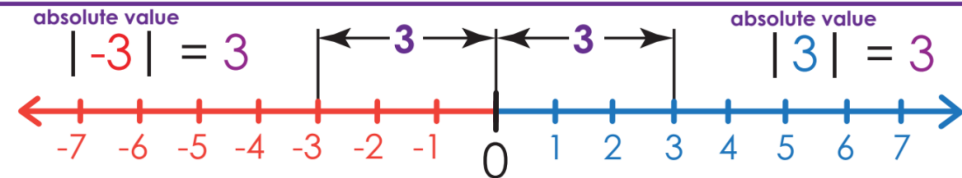
[3] Order the given set of numbers from least to greatest:

7.7	7	-3.8	$7\frac{1}{2}$	$-3\frac{1}{5}$	......	......	......	......	......

Concept (3)

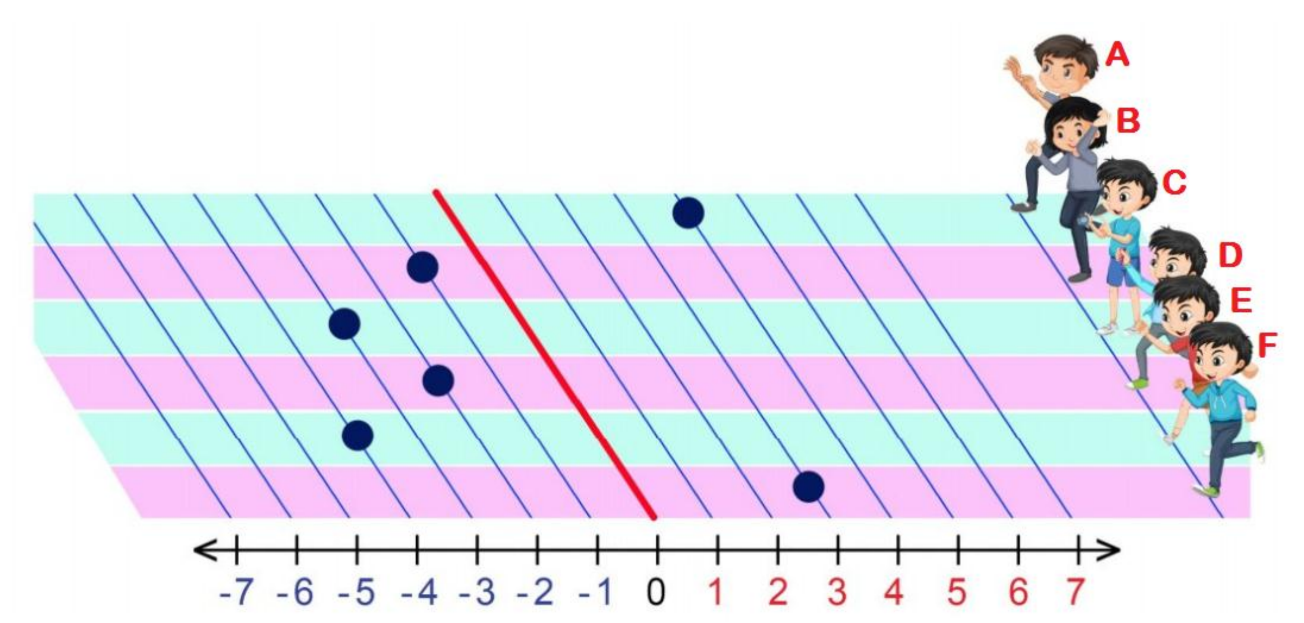
Lesson (5)	Exploring Absolute Value
Lesson (6)	Comparing Absolute value

absolute value



How far a number is from zero. (Same as magnitude)







[1] Complete using (<) , (>) , or (=):

(1) $|-4|$ ...... $|-3|$

(2) -1.4 ...... $|-1.4|$

(3) $\left|9\frac{3}{5}\right|$ ...... $\left|-9\frac{3}{4}\right|$

(4) $|-8.2|$ ...... -7.9

(5) $5\frac{5}{6}$ ...... $\left|-\frac{35}{6}\right|$

(6) $|-2.71|$ 2.7



[2] Read the passage carefully, and then answer:

The elevations of several ponds are given. Complete the table to order the elevations from closest to sea level to farthest from sea level.

Pond	Elevation (in meters)
A	-28
B	-430
C	33
D	89
E	-214

Closest to sea level		⟶	Farthest from sea level	



[3] Complete:

1. $|-15| =$ ....
2. $|-5| =$ ....
3. $|6| =$ ....
4. $\left|-5\frac{1}{2}\right| =$ ....
5. $\left|2\frac{3}{7}\right| =$ ....
6. If $|m| = 10$, then $m =$ .... or ....
7. If $k = |-6.6|$, then $k =$ ....
8. If $n = |15|$, then $n =$ ....
9. Which is closest to zero -2.5 or 0.7 ? ....



[4] Order the given set of numbers from least to greatest:

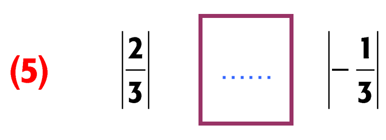
(1)	2.5	-3.4	$\|-5.3\|$	-4	$\|0.8\|$	......	......	......	......	......
(2)	8	-17	$\|-3\|$	-9	$\|12\|$	......	......	......	......	......
(3)	$\frac{3}{4}$	$\frac{-5}{8}$	$\left\|\frac{-1}{2}\right\|$	$\frac{-5}{4}$	$\left\|\frac{1}{4}\right\|$	......	......	......	......	......



Homework

[1] Complete using (<) , (>) , or (=):

(1)	-0.7	......	|-0.7|	(2)	|-9|	......	|-8|	(3)	$\left\|\frac{-7}{9}\right\|$	......	$\frac{-7}{8}$
(4)	5.7	......	|-5.7|	(5)	$\left\|\frac{2}{3}\right\|$	......	$\left\|-\frac{1}{3}\right\|$	(6)	|3.4|	......	|-3.4|
(7)	$\left\|3\frac{1}{4}\right\|$	......	$\left\|-7\frac{2}{5}\right\|$	(8)	$\left\|-2\frac{3}{4}\right\|$	......	$-\left\|4\frac{2}{3}\right\|$	(9)	$\left\|\frac{-8}{3}\right\|$	......	$2\frac{2}{3}$



[2] Complete:

1. If |a| = 5, then a = ... or ....
2. If b = |-7|, then b = ...
3. If n = |9|, then n = ...
4. - |-5| = ...
5. - |4| = ...
6. |3| + |-3| = ...
7. |7| - |-7| = ...



[3] Choose the correct answer:

(1) |-1.5| = ...
ⓐ 1.5 ⓑ -1.5 ⓒ 15 ⓓ -15

(2) |6| = ...
ⓐ 6 ⓑ -6 ⓒ 3 ⓓ -3

(3) The absolute value of the number 2.7 is ....
ⓐ -2.7 ⓑ 2.7 ⓒ 27 ⓓ -27

(4) The absolute value of zero is ....
ⓐ 10 ⓑ 0 ⓒ -1 ⓓ 1



Unit (2) Assessment

[1] Choose the correct answer:

(1) The number -7 is located to the right of the number .... on the number line.

a) -8 b) 8 c) -6 d) 6

(2) The number .... is neither negative nor positive.

a) 0 b) 1 c) -1 d) 10

(3) The smallest non-negative integer is ....

a) -1 b) 1 c) 100 d) 0

(4) -0.3 = ... (in the form $\frac{a}{b}$)

a) $\frac{10}{3}$ b) $\frac{-3}{1}$ c) $\frac{-1}{3}$ d) $\frac{-3}{10}$

(5) |-3.7| = ...

a) 3.7 b) 37 c) -3.7 d) -37

(6) The absolute value of zero = ...

a) 1 b) 10 c) 0 d) -1

[2] Complete:

(3) The greatest non-positive integer is ....

(4) The smallest positive integer is ....

(5) The integer that represents 7 °C below zero is ....

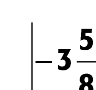
(6) The integer that comes just after -8 is ....

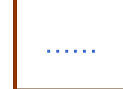
(7) If |a| = 8, then a = ... or ....

[3] Order the given set of numbers from least to greatest:

|-0.8|	$\frac{-1}{4}$	$\left\|\frac{-1}{2}\right\|$	$\frac{-3}{5}$	0.7	......	......	......	......	......

[4] Complete using (<) , (>) , or (=):

(1) -3.8 [......] -1.8 (2) $-3\frac{7}{8}$  [......]  $\left|-3\frac{5}{8}\right|$

(4) $\left|\frac{2}{5}\right|$ [......] |-0.4| (5) |-2.5|  [......] |-3.6|







UNIT 3

Theme 1 | Number Sense and Operations: Expressions and Equations

Algebraic Expressions



Concept (1): Use and Analyze Expressions

Lesson (1)	Creating Mathematical Expressions
Lesson (2)	Analyzing Mathematical Expressions

Variable & Constant:

The variable is a letter as: x or y or n or ... represents any number. But the constant (absolute term) is a number such as 5 or 7 or 9 …..

Algebraic Term:

The algebraic term consists of the product of two factors or more.

For Example:

2 x , 7 y , 9 m , 3 x y , …

Remarks:

(1) In algebraic term 7x the number 7 is called numerical factor or (coefficient) and x is called algebraic factor.

(2) The algebraic terms are said to be like terms if the algebraic symbols forming their factors are like and the indices (Powers) of these symbols are equal.

For Example:

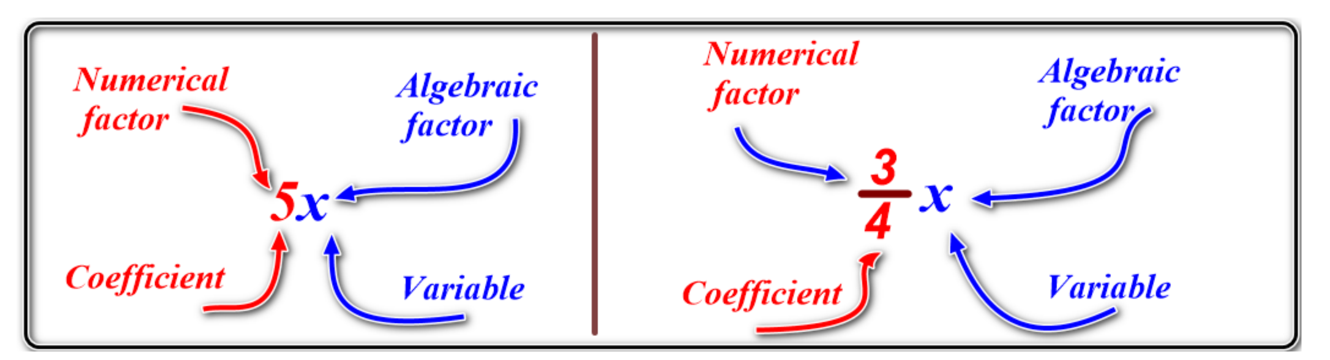
$3x^2$, $5x^2$ $-9x^2$ are like terms, also 4y , 6y , -3y are like terms

Remark:

If an algebraic term consists of one algebraic factor, then the coefficient is 1 or -1.

For example:

- In the algebraic term “x” the coefficient is “1”
- In the algebraic term “-x” the coefficient is “-1”





Algebraic Expression:

The algebraic expression consists of one or more terms connected by the sign + or –

For Example:

$x + 2, 3x - y, 3mn - 7, \ldots$ etc

Learn:

Equation is a mathematical sentence that has two expressions separated by an equal sign (=). One or both expressions contains one unknown (or more)

For Example:

$x + 5 = 7, \quad 3m + n = 10, \quad 8xy = 15$

[1] Complete the following table:

	Algebraic term	Numbers of factors	Coefficient	Algebraic factors
1	$5xy$	3	5	x , y
2	$7m$			
3	$-5x$			
4	$\frac{3}{7}y$			
5	$8n$			
6	$\frac{2}{5}x$			



[2] Complete the following table:

	Mathematical expression	Numbers of terms	Coefficient	Algebraic factors
1	$5x + 3y$	2	5 , 3	x , y
2	$7m - 6n$			
3	$4k - 5x + 9$			
4	$\frac{3}{7}y + 10$			
5	$8n - 4$			
6	$\frac{2}{5}x + 8$			



[3] Classify the following mathematical expressions into (numerical expression) or (algebraic expressions) Put Tick (✓):

	Mathematical expression	Numerical expression	Algebraic expression
1	$9 + 5 - 2$	✓	
2	$7x + m$		✓
3	$-5 + 7 + 2$		
4	$2x + 5y - 2z$		
5	$3m - 2n + 9$		
6	$3(5x + 2y)$		
7	$3x + 5y + x + 6y$		
8	$2(1.8 + 0.6)$		



[4] Complete the following table:

	Mathematical expression	Numbers of terms	Like terms
1	$3x + 2y - 5x$	3	$3x, -5x$
2	$3.5m + 1.7n$		
3	$6xy - 5k + 2xy$		
4	$5.7k + 4.2k$		
5	$4y + 5x - 4y + 9$		
6	$\frac{2}{5}m + \frac{2}{5}km + 6m$		
7	$1.3a + 2b + 5.7a$		



Homework

[1] Choose the correct answer:

(1) The algebraic expression $\frac{1}{5}$ k consists of …… factors.

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(2) In the algebraic term $9\ z\ y^2$ the coefficient = …….

ⓐ 9 ⓑ 2 ⓒ 3 ⓓ 4

(3) The algebraic term -5 x z has ……. Factors.

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(4) The number of terms that make up the algebraic expression (5 m + 2 n – 9) is ……

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(5) The like terms in the algebraic expression (5 m + 2 n – 9 m + 2) are ……

ⓐ 2 n , 2 ⓑ 5 m , - 9 m ⓒ 5 m , 2 n ⓓ nothing



[2] Complete:

(1) The number of terms and the algebraic expression 3 m – 2 n + 8 is ……………

(2) Like terms in the algebraic expression 3 a + 2 b – 5 a + 9 are …………………

(3) The constant in the algebraic expression 5 k + 8 is …………………

(4) The number of variables in the algebraic expression 3x y +2 z +5 m is ……………

(5) The coefficients in the algebraic expression 5 k + 3 m – 8 are …………………

(6) Two numbers the sum of them is 10 if first one is “x” so the second one is ……....…

(7) Ahmed and Tamer have 60 pounds if Ahmed has “x” pounds, then Tamer has ……………… pounds.





Lesson (3) Writing Algebraic Expressions

Examples for Addition:

(1) We can write (13 + n) to represent 13 added to n.

(2) We can write (a + b) to represent the sum of a and b.

(3) We can write (p + 10) to represent p increased by 10.

(4) We can write (x + 10) to represent the total of x and 10.

(5) We can write (9 + m) to represent 9 plus m.



Examples for Subtraction:

(1) We can write (y – x) to represent subtract x from y.

(2) We can write (x – 7) to represent the difference between x and 7.

(3) We can write (m – 10) to represent 10 less than m.

(4) We can write (p – 11) to represent the p decreased by 11.

(5) We can write (p – 6) to represent p reduced by 6.

(6) We can write (x – y) to represent x exceeds y.



Examples for Multiplication:

(1) We can write (7 y) to represent 7 times y.

(2) We can write (x y) to represent the product of x and y.

(3) We can write (5 y) to represent 5 multiplied by y.

(4) We can write ($\frac{1}{5}x$) to represent one fifth of x.





Examples for Division:

(1) We can write (m ÷ 6 or $\frac{m}{7}$) to represent. m divided by 6

(2) We can write (x ÷ 3 or $\frac{x}{3}$) to represent. Divide x by 3

(3) We can write (x ÷ 7 or $\frac{x}{7}$) to represent. 7 divides x.

(4) We can write (x ÷ 9 or $\frac{x}{9}$) to represent. quotient of x and 9



[1] Re-write the following phrases as an algebraic expression:

(1) A number minus 18. (.....................................)

(2) The sum of seven and x. (.....................................)

(3) Two times eight. (.....................................)

(4) Six increased by twelve. (.....................................)

(5) Eight divided by twice a number. (.....................................)

(6) The product of a number and thirteen. (.....................................)

(7) The quotient of x and four. (.....................................)

(8) x minus four. (.....................................)

(9) x times eleven. (.....................................)



Notes:

An algebraic expression can have more than one operation.
Parentheses are used to express the result of addition or subtraction.

For Example:

The following algebraic expressions have two operations:

$2x + 5$
Sum of the double of x and 5
$7x - 3$
The difference between 7 times x and 3

$2(x + 5)$
Double of the sum of x and 5
$7(x - 3)$
7 times the difference between x and 3

Notice the change in the verbal expression when using the parentheses.



[2] Express each of the following verbal from using algebraic expressions.

(1) Adding x to 32 (.............................)

(2) p increased by 9 (.............................)

(3) m less than twelve (.............................)

(4) Sixteen less than m (.............................)

(5) 8 divided by n (.............................)

(6) The product of 6 and c (.............................)

(7) f minus m (.............................)

(8) Two more than m (.............................)

(9) Three-fourths of k (.............................)

(10) The sum of 5 and k (.............................)

(11) The quotient of b and 3 (.............................)

(12) The triple of m (.............................)

(13) m increased by p (.............................)

(14) 12 more than d (.............................)

(15) Double of x minus 3 (.............................)

(16) Exceeds m by 15 (.............................)

(17) 8 reduced by s (.............................)

(18) h divided by 3 then add 1 (.............................)

(19) x minus 5 plus m (.............................)





[3] Write each of the following algebraic expression in the verbal form:

(1) $9 + b$ ....

(2) $K - 2.5$ ....

(3) $X \div 7$ ....

(4) $9\ m$ ....

(5) $6\ x + 6$ ....

(6) $7 - 2\ x$ ....

(7) $9\ e + 1$ ....

(8) $2\ (t + 7)$ ....

(9) $\frac{h}{3} + 1$ ....

(10) $2\ m - 5$ ....

(11) $\frac{1}{3}\ x + 6$ ....

(12) $\frac{1}{3}\ (x + 6)$ ....



Concept (2)

Lesson (4) Ordering of Operations and Exponents

You know how to factorize a number by writing it as the repeated multiplication.

For Example:

$$16 = 2 \times 2 \times 2 \times 2$$

- A third form of writing the number 16 is 2^4
- 2 is called "the base" and 4 is called "the power" OR "Exponent."
- It is read as: 2 to the power 4" OR "2 to the fourth power

For Example:

- $7 \times 7 = 7^2$, it is read as "7 to the power 2" OR "7 to the second power".
- $6 \times 6 \times 6 = 6^3$, it is read as "6 to the power 3" OR "6 to the third power".



[1] Complete the following:

(a) $3 \times 3 \times 3 \times 3 \times 3 = 3^{\dots\dots}$

(b) $5 \times 5 \times 5 = 5^{\dots\dots}$

(c) $6 \times 6 = 6^{\dots\dots}$

(d) $m \times m \times m = m^{\dots\dots}$

(e) $1 \times 1 \times 1 = \dots\dots^{\dots\dots} = \dots\dots$

(f) $8 \times 8 \times 8 \times 8 \times 8 = \dots\dots^{\dots\dots}$

(g) $5^3 = \dots \times \dots \times \dots$

(h) $4^5 = \dots \times \dots \times \dots \times \dots \times \dots$



[2] Find the value of each of the following:

(a) $3^2 = \dots\dots\dots\dots\dots$

(b) $4^3 = \dots\dots\dots\dots\dots\dots\dots\dots$

(c) $7^2 = \dots\dots\dots\dots\dots$

(d) $2^5 = \dots\dots\dots\dots\dots\dots\dots\dots$

(e) $1^2 = \dots\dots\dots\dots\dots$

(b) $0^5 = \dots\dots\dots\dots\dots\dots\dots\dots$

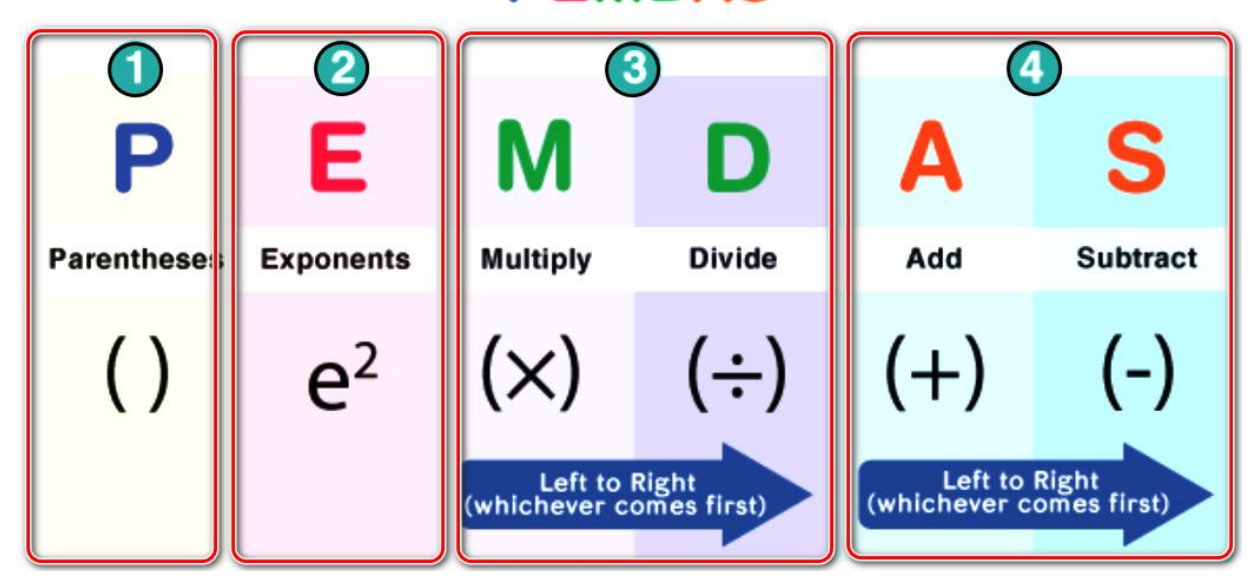




Order of Operations

Please Excuse My Dear Aunt Sally

PEMDAS





[3] Follow the order of operations to find the value of each of the following:

(1) 13 + 6 ÷ 2 = ...

(2) 2 × 6 – 4 ÷ 2 = ...

(3) (3 -1) + 4 ÷ 2 = ...

(4) 4× 2^3 – 20 = ...

(5) (2 + 1) × (9 – 6) + 18 = ...

(6) 20 + 5 + 8 – (4 – 1) = ...

(7) (7 – 4) × 2 + (5 – 3) = ...

[4] Calculate the value of each of the following:

(1) $2 - [(7 - 3) - 2]$

= ....

= ....

= ....

(2) $[7 - (5 - 2)] - 1$

= ....

= ....

= ....

(3) $[2 \times (4 + 8) + 5] + 3$

= ....

= ....

= ....

= ....

(4) $23 + [4 + (2 - 1)]$

= ....

= ....

= ....

= ....

(5) $[(2 + 23 - 7) \times 2] + 4$

= ....

= ....

= ....

= ....

(6) $10 \times 3 + [4 - (9 - 8)]$

= ....

= ....

= ....

= ....

[5] Choose the correct answer:

		a	b	c	d
(1)	$3^2 =$	6	9	3	12
(2)	$6^0 =$	1	60	6	9
(3)	$5^2 - 4^2 =$	1	25	16	9
(4)	$6^2 - 1^6 =$	6	7	35	5
(5)	$4^2 + 40 \div 5 =$	20	12	24	12



Homework

[1] Re-write the following sentences into an algebraic expression:

(1) e divided by 5 (............................)

(2) b decreased by 14 (............................)

(3) The product of 4 and g (............................)

(4) 10 times t divided by 3 (............................)

(5) d increased by 2 (............................)

(6) The difference between one-eighth and r (............................)

(7) The difference between z and 20 (............................)

(8) Twice j added to7 (............................)

(9) 7 times p (............................)

(10) 6 multiplied by m (............................)



[2] Write each of the following algebraic expression in the verbal form:

(1) $10 - 5$ ....

(2) $X \div 9$ ....

(3) $2x + 4$ ....

(4) $P + 5$ ....

(5) $U - 9$ ....

(6) $7m$ ....

(7) $2x = 27$ ....

(8) $n - 9 = 45$ ....



[3] Complete the following:

(1) 6^2 = …… × ……. = …………

(2) $2^3 - 3$ = …… − ……. = …………

(3) 8 × 8 × 8 = ……$^{.......}$

(4) 6 + 2 × 4 = ……………………………….

(5) (10 – 4) + 6 × 5 = ………………………..

(6) $4^2 + (9 + 7) \div 4$ = ………………………



[4] Choose the correct answer from those given:

(1) $7^1 + 1^5$ = ……………………………….

(2) $9^0 + 9$ = ……………………………….

(3) $3^3 + 3^2$ = ………………………………..

(4) 3 + 4 ÷ 2 = ……………………………..

(5) (9 + 15) ÷ 6 = …………………………..

(6) $6^2 - 5^2$ = ………………………………..



[5] Find the value of each of the following:

(1) 19 – (15 – 4) = ………………………………………………………

(2) 12 – (8 – 5) + 7 – 3 = …………………………………………………

(3) (19 – 7) × (36 ÷ 3) = …………………………………………………

(4) $(10 - 3^2) \times (9 - 4)^2 \div 5$ = ………………………………………………



Lesson (5) Evaluating Algebraic Expressions

[1] Evaluate each algebraic expression using the values given:

(1) $2x + 6$ [if $x = 3$]

=..........................

=..........................

=..........................

(2) $5m - 2$ [if $m = 4$]

= ....

=..........................

= ....



(3) $20 - 4x$ [if $x = 2$]

= ....

= ....

= ....

(4) $3a + 9$ [if $a = 5$]

= ....

= ....

= ....



(5) $3b - 4 \div 2$ [if $b = 4$]

= ....

= ....

= ....

(6) $(2m + 5) \div 3$ [if $m = 5$]

= ....

= ....

= ....



(7) $(k^2 + 1) \div 2$ [if $k = 7$]

= ....

= ....

= ....

(8) $20 \div (m^2 + 1)$ [if $m = 3$]

= ....

= ....

= ....



[2] Chose the correct answer:

(1) If: $x + 3 = 5$, then $4x =$ ....

ⓐ 4 ⓑ 4 ⓒ 8 ⓓ 32

(2) The value of the expression $4n - 5$ [if $n = 2$] is ....

ⓐ 1 ⓑ 3 ⓒ 37 ⓓ 12

(3) The value of the expression $2a + 6$ [if $a = 5$] is ....

ⓐ 9 ⓑ 6 ⓒ 16 ⓓ 4

(4) If $x = 1$, then $x^5 =$ ......

ⓐ 6 ⓑ 1 ⓒ 5 ⓓ 4

(5) If $5x = 10$, then the value of x is ....

ⓐ 5 ⓑ 4 ⓒ 3 ⓓ 2



[3] Complete the following:

(1) In the rule: $y = x + 4$, if $x = 1$, then y would be ....

(2) If: $m - 2 = 7$, then $m + 1 =$ ....

(3) If: $8m = 0$, then, $100m =$ ....

(4) If: $m = 8$, then $6 + m =$ ....

(5) If: $x = 2$, Then $3x - 5 =$ ....



Lesson (6) Applications on Algebraic Expressions

Write an algebraic expression

Ex. If the price of a small bottle of water is 3 pounds, then the price of:

2 bottles: 3 X 2
3 bottles: 3 X 3
4 bottles: 3 X 4
5 bottles: 3 X 5

Constant (3) — Variable (2, 3, 4, 5)



Notes From the above, we notice that:

- The price of a bottle is constant, while the number of bottles changes.
- If we denote the number of bottles by "x", then the algebraic amount that represents the purchase price of "x" bottles is 3



[1] Write the algebraic expression that represents each of the following statements:

(1) If the price of one book is 20 pounds what is the price of X box?

....

(2) If a meal costs 55 pounds, what is the price of “m” meals of the same type?

....

(3) Ahmed bought “x” kilograms of orange and put them in a box the costs 5 pounds. If the price of 1 kilogramme of orange is 30 pounds what is the amount paid by Ahmed?

....

(4) A TV costs “x” pounds. A DVD player costs 45 pounds less than the TV. Write an expression for the total cost of the TV and DVD player.

....

(5) If the price of one pen is 8 pounds, what is the price of "X" pens?

....

(6) Salah saves "z" pounds per day. How much does he save in a week?

....

(7) Mona wants to know how many legs there are on a farm of h horses and c hens.

....

(8) Sara has a part-time job paying 105 pounds per hour. Write an algebraic expression for her earnings after she has worked for x hours.

....



[2] Choose the correct answer:

(1) If the price of one T-shirt is 120 Egyptian pounds, then the price of m T-shirt is ....

(a) 120 m (b) 120 + m (c) M – 120 (d) 120 ÷ m

(2) If Hanan saves "d" pound daily for 5 days, then her father gives her 20 pounds, then the amount that Hanan has now is...........

(a) 5d -20 (b) 5d + 20 (c) 20 -5d (d) 5 (d + 20)

(3) The value of the expression 2 a + 6 [if a = 5] is ....

(a) 9 (b) 6 (c) 16 (d) 4

(4) If x = 1, then 5^x = ...

(a) 6 (b) 1 (c) 5 (d) 4

(5) The value of expression 3 x + 7 [if x = 4] is ....

(a) 10 (b) 15 (c) 22 (d) 19

[3] Mira has 25 L.E. in her money box. She will save 20 L.E. daily.

(a) What algebraic expression represents this situation?

....

(b) How much money in her money box after 3 days?

....

(c) How much money in her money box after 6 days?

....



[1] Complete:

(1) If the price of one book equals 7 L.E., then the price of 7 books = ...

(2) Sarah saved k L.E. daily, so the money she saved in a week = ...

(3) Mira has 25 L.E. in her money box. She will save 10 L.E. daily.

(a) What algebraic expression represents this situation?

....

(b) How much money in the money box after 3 days?

....

(c) How much money in the money box after 6 days?

....

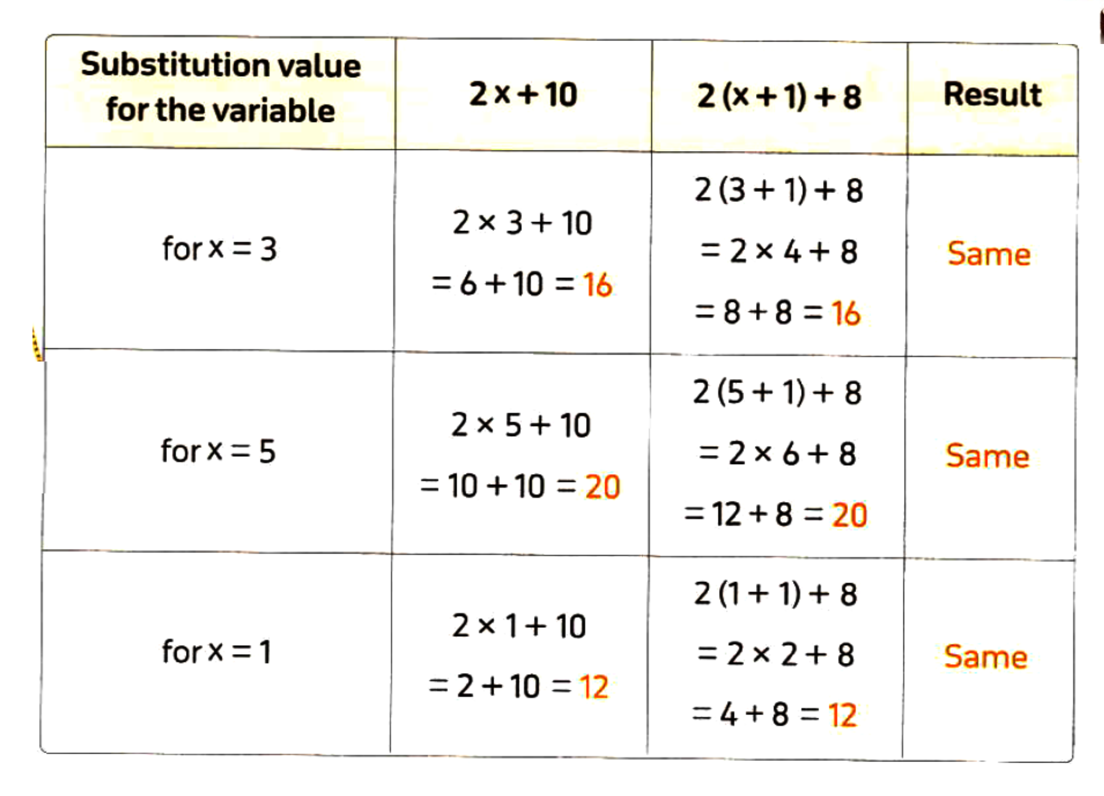


Lesson (7) Determining Equivalent Algebraic Expressions

Definition

Equivalent algebraic expressions are expressions that even though. they look different, they yield the same result. Whatever the number we substitute for the variable.

For Example:



Substitution value for the variable	$2x + 10$	$2(x + 1) + 8$	Result
for $x = 3$	$2 \times 3 + 10$ $= 6 + 10 = 16$	$2(3 + 1) + 8$ $= 2 \times 4 + 8$ $= 8 + 8 = 16$	Same
for $x = 5$	$2 \times 5 + 10$ $= 10 + 10 = 20$	$2(5 + 1) + 8$ $= 2 \times 6 + 8$ $= 12 + 8 = 20$	Same
for $x = 1$	$2 \times 1 + 10$ $= 2 + 10 = 12$	$2(1 + 1) + 8$ $= 2 \times 2 + 8$ $= 4 + 8 = 12$	Same



1. Evaluate the following expressions using two positive integers of your choosing to complete the table.

The value of x	$x + 2x$	$2(x + 2)$	Equal ?
for $x =$ ______	______ ______ ______	______ ______ ______	______
for $x =$ ______	______ ______ ______	______ ______ ______	______



Complete.

The value for x	1st expression	2nd expression	have the same value or not
a. If $x = 2$	$3x - 5$ ______ ______ ______	$3(x+1) - 6$ ______ ______ ______	______
b. If $x = 5$	$10 + 2(x - 1)$ ______ ______ ______	$2x + 8$ ______ ______ ______	______
c. If $x = 3$	$14 + 2x$ ______ ______ ______	$8 + 3(x+2)$ ______ ______ ______	______
d. If $x = 1$	$14 + 2x$ ______ ______ ______	$8 + 3(x+2)$ ______ ______ ______	______



[2] Evaluate each of these algebraic expressions using two positive integers of your choice. If the algebraic expressions are equal, answer yes. If algebraic expressions are not equal, answer no.

(a)	$5x + 5$	$5(x + 1)$	Equal or not?
If x = …… If x = …….	…………………… ……………………	…………………… ……………………	……………………



(b)	2 x + 3 x +1	5 x + 1	Equal or not?
If x = …… If x = …….	…………………. …………………….	…………………. …………………….	…………………….



Homework

	9 x + 6	9 (x + 6)	Equal or not?
If x = …… If x = …….	…………………. …………………….	…………………. …………………….	…………………….



2. **Are they equivalent ?** Examine these two expressions and determine whether they are equal. If so, consider whether they are always equal. Complete each task. "Use positive integer values for x" $3(x+2)$ $2x+x+6$

a. Try to find a value for x that will make these expressions equal.

____

____

____

b. Try to find a value for x that will make the expressions not equal.

____

c. Decide if these two expressions are always equal and if they should be considered equivalent expressions.

____



Unit (3) Assessment

[1] Choose the correct answer.

1	Number of terms of the expression $3x + 2y - 5$ is ______ A. 2 B. 3 C. 4 D. 5
2	Which of the following are like terms ? A. 5 , 7 B. $2x , x^2$ C. 5 a , 5 b D. m^2 , n^2
3	Sameh has 50 L.E. He bought 3 pens each for k L.E. , then the remainder is ______ A. 30 B. 3 + 50 k C. 50 – 3 k D. 50 + 3 k
4	Volume of a cube of edge length 5 cm is ______ cm^3 A. 6×5 B. 25 C. 5^3 D. 5^2
5	Which of the following expression has the same value of $3x + 5$ at $x = 3$ A. $3(x+1)+5$ B. $4x+1$ C. $5x+3$ D. x^2+5
6	5 times a number less 7 is ______ A. 5 b + 7 B. 7 – 5 b C. $b^2 - 7$ D. 5 b – 7
7	The first operation or exponent you perform in $3 \times 5 + 3(2^3 - 5) - 4 \div 2$ A. parantheses B. plus C. multiply D. exponent
8	7 + 3 (______ + 5) – 4 , complete to get a numeric expression. A. b B. k^2 C. $12 \div 2$ D. x + y
9	a. $5 \times 5 \times 5 \times 5 =$ ______ A. 5×4 B. 5^4 C. 4^5 D. 20
10	If the product of x and 5 is 45 , then x equals ______ A. 45×5 B. 45 + 5 C. 45 – 5 D. $45 \div 5$



[2] Complete the following:

1	The verbal form of the expression $5 - k$ is ....
2	$9 \times 9 \times 9 \times 9 \times 9 \times 9 = 9^{\dots}$
3	In the algebraic expression : $5x - 3y^2 + 4$, the constant is ....
4	Five squared = ...
5	c. The two like algebraic terms $5 - 4x + 7^2$ are ....
6	$5 + (3^2 - 2) \times 7 =$ ....
7	Area of the square whose side length 7 cm in the exponential form is .... cm^2
8	Twice the sum of a number and three in algebraic form is ....



[3] Essay Questions: Answer the following:

① If the ticket of entring a car park is 25 L.E. and 10 L.E. for each hour you spend.

First : Write an algebraic expression to represent the relation between the total cost and the number of hours.

....

....

Second : What is the cost of spending 5 hours in the park ?

....

....



② Use the order of mathematical operations to simplify : $40 + 5(3^2 - 7) + 10$

....

....





4 **Evaluate the expression :** $5x^2 + 8 \div (6 - 4) \div 2$ at $x = 3$

____

____

____



4 Evaluate each pair of the algebraic expressions at the given value for the variable and determine where the two expressions are equivalent or not.

4 x + 2 and 2 (x + 2) [if x = 1] and [x = 6]

(c)	4 x + 2	2 (x + 2)	Equal or not?
If x = ... If x = ...	....	....	....



5 Write algebraic expression to find the area of the opposite figure

____

____

5 cm

x cm 10 cm









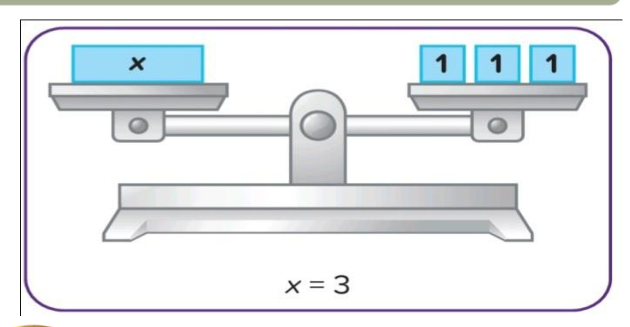
UNIT 4

Theme 1 | Number Sense and Operations: Expressions and Equations

Equations and Inequalities

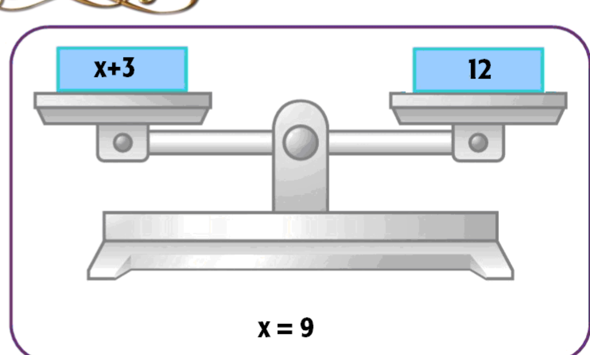
Concept (1)

Lesson (1) Solving Algebraic Equations



Equation: $X = 1+1+1$

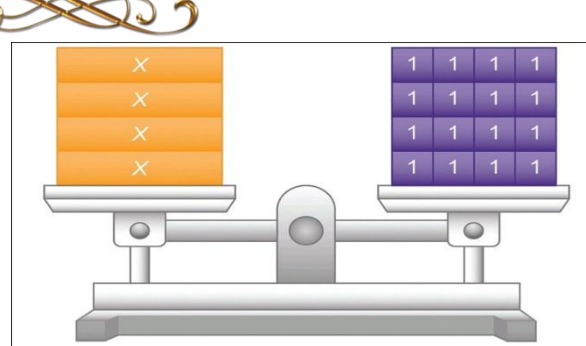
$X = 3$



Equation: $X + 3 = 12$

$X = 12 - 3$

$X = 9$



Equation: $4X = 16$

$X = 16 \div 4$

$X = 4$



[1] Choose the correct answer:

(1) $3x = 12$, Then $x =$ ....

ⓐ 1 ⓑ 2 ⓒ 3 ⓓ 4

(2) $y + 4 = 12$, Then $y + 2 =$ ......

ⓐ 4 ⓑ 5 ⓒ 8 ⓓ 10

(3) $m = 5$, Then $m = \frac{1}{2}$ ....

ⓐ 10 ⓑ 16 ⓒ 18 ⓓ 45



[2] Complete:

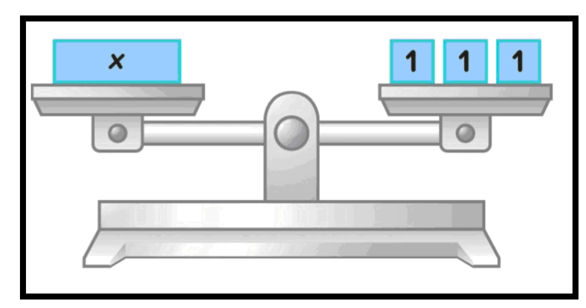
A) If: $x - 1 = 3$, Then $x =$ ....

B) If: $2x = 8$, Then $x =$ ....

C) If: $z + 5 = 11$, Then $z =$ ....

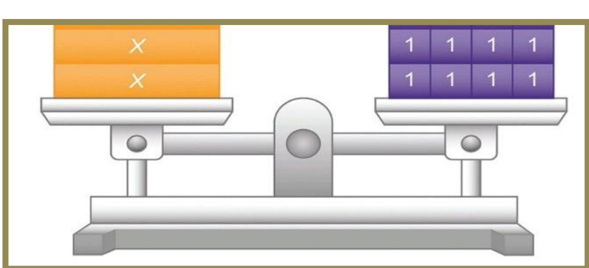


Find the value of x.





Find the value of x.





[4] Solve the following equations:

(A) $y + 5 = 14$	(B) $m - 7 = 10$	(C) $4x = 20$
....	....	....
....	....	....
....	....	....
....	....	....

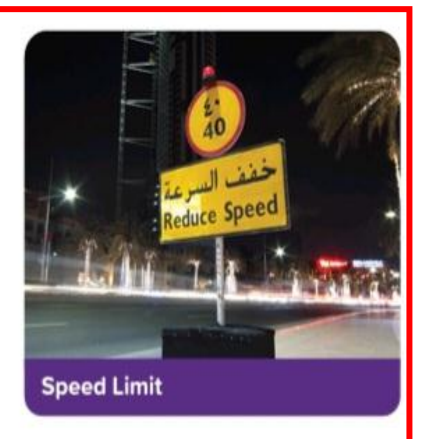
[5] Write an equation for the following models, then solve it:

....	....
....	....
....	....
....	....
....	....
....	....
....	....
....	....



Lesson (2) Exploring Inequalities

Road Sign The sign shows the speed limit for a road in kilometers per hour. Record all speeds that are acceptable to drive on the road.



Speed Limit

A. 38 km/hr
B. 50 km/hr
C. 30 km/hr
D. 40 km/hr
E. 43 km/hr
F. 49 km/hr



Sale Sign The sign shows the sale prices of some clothing on a sale rack. Use the sign to determine any prices you might expect to pay for an item from this rack. Record all prices that apply.



Sale Prices

A. 14.98 tokens
B. 18.97 tokens
C. 15.75 tokens
D. 29.83 tokens
E. 12.76 tokens
F. 15.79 tokens



Height Sign The sign shows the height limits for an amusement park ride.



Ride Height Resctrictions

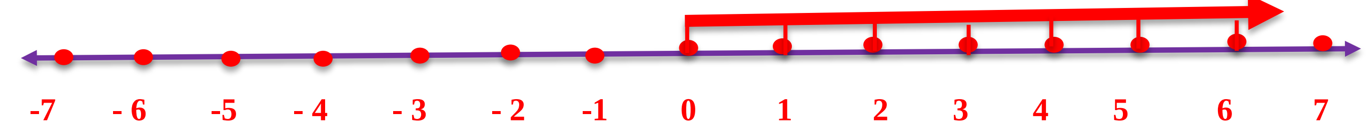
A. List three acceptable heights for a person to be able to ride the roller coaster.

B. List three unacceptable heights for a person to be able to ride the roller coaster.



Lesson (3) Solving Inequalities

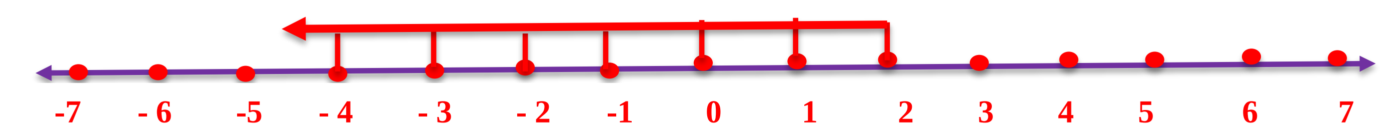
(A) The inequality: $X > -1$



The inequality $X > -1$ includes all the values to the right of -1 on the number line.



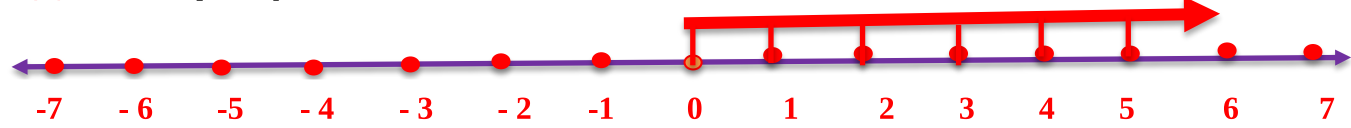
(B) The inequality: $X < 3$



The inequality $X < 3$ includes all the values to the left of 3 on the number line



(C) The inequality: $X \geq 0$



The inequality $X \geq 0$ includes the point zero and all the values to the right of zero on the number line



[1] Put true or False:

A) −2 belongs to the solution set of inequality $X > -2$ (   )

B) 4 belongs to the solution set of inequality $X > 4$ (   )

C) 3 belongs to the solution set of inequality $X > 0$ (   )



[2] Write the inequality that represents each of the following expressions:

A) All values greater than -1: ....

B) All values less than 3: ....

C) All values to the right of -5 on the number line: ....



[3] Write an equation for the following models, then solve it:

....	....
....	....

Unit (4) Assessment

[1] Choose the correct answer:

(4) The inequality representing the statement "all values greater than -5" is …

ⓐ $X > -5$ ⓑ $X < -5$ ⓒ $X \geq 5$ ⓓ $X \leq 5$

(5) Which of the following values is a solution of the inequality $x < -2$?

ⓐ 0 ⓑ 1.5 ⓒ -3 ⓓ -2

(6) Number of solution set of inequality $X > 6$ is ……. ?

ⓐ 1 ⓑ 0 ⓒ -2 ⓓ Infinite



[2] Complete:

(A) All values greater than -1 are: ….. , ……. , ……. , ……. , ……

(B) All values smaller than 3 are: ….. , ……. , …….. , ……. , ……

(C) $3Y = 21$, Then $Y =$ …….

(D) $N + 5 = 16$, Then $N - 1 =$ ….



[3] From the opposite figure:

Write an Equation and Solve Answer the following questions.



a. Write an equation for the opposite model.

____

b. Solve the equation. How do you know that you solved the equation correctly ?

____

____









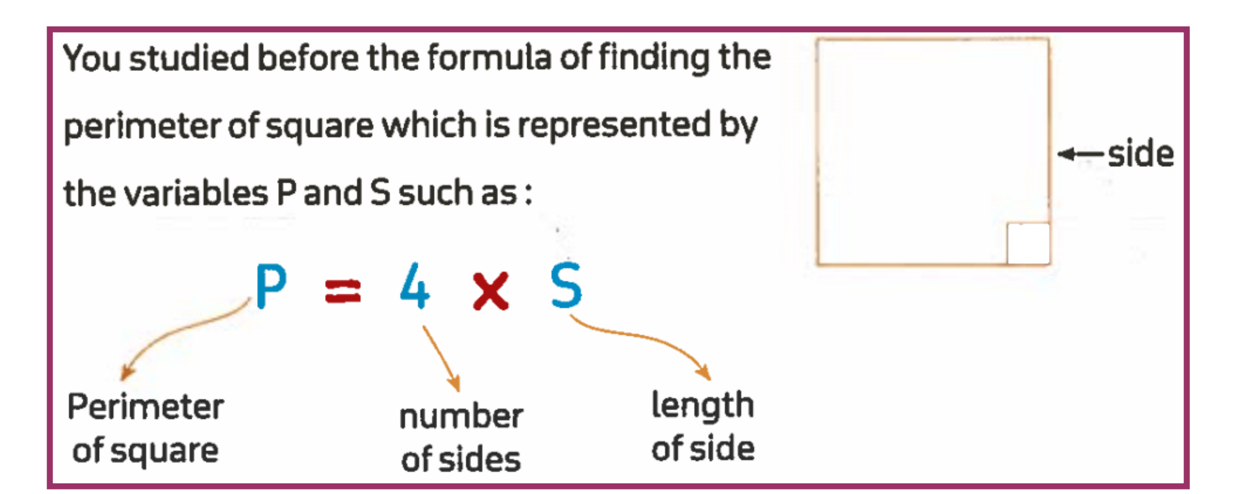
UNIT 5

Theme 2 | Mathematical Operations and Algebraic Thinking: Statistics and Data Analysis

Dependent and Independent Variables

Concept (1)

Lesson (1) The Relationship Between Dependent and Independent Variables



The perimeter of square "P" depends on the length of its side "S", then "P" is called Dependent variable, "S" is called Independent variable and the mathematical relationship between variables "P" and "S" is dependency.

Dependency: in some relationships, one quantity depends on the other.



[1] Use the following equations and complete the table:

	The Equation	Dependent Variable	Independent Variable
a.	$x = 5y$	…………	…………
b.	$a = b - 12$	…………	…………
c.	$m = 5c - 7$	…………	…………
d.	$n = 8m + 12$	…………	…………



[2] Write each statement as an algebraic equation:

(1) 7 more than x equals y ....

(2) 33 more than s equals t ....

(3) g increased by 10 equals e ....

(4) x equals the sum of sixty three and z ....

(5) Five times c equals d ....

(6) k equals the product of 4 and h ....

(7) m equals twice n increased by 37 ....

(8) s equals the double of r added to 42 ....



[3] Write each equation as a verbal phrase:

(1) $x = 2y$ ....

(2) $z = y - 5$ ....

(3) $k + 20 = h$ ....

(4) $s - 3 = t$ ....

(5) $x + 14 = y$ ....

(6) $k + 2 = h$ ....



Lesson (2) Applications on Dependent and Independent Variables









If "t" is the total number of tickets, "r" is the number of times you want to ride the game, answer the following:

(1) If t = 6 r, what is the chosen game? ....

(2) If t = 8 r, what is the chosen game? ....

(3) If t = 3 r, what is the chosen game? ....

(4) If t = 5 r, what is the chosen game? ....

(5) If your brother wants to ride the Ferris wheel once and you are not sure what times you want to ride it. Write the equation that represents this situation.

....



Homework

[1] Use the following equations and complete the table:

	The Equation	Dependent Variable	Independent Variable
a.	$b = 2a$	....	....
b.	$n = 3 - m$	....	....
c.	$y = x - 5$	....	....
d.	$h = 3k + 10$	....	....
e.	$y = 18 - x$	....	....
f.	$d = 6 + 6c$	....	....
g.	$14 + 2e = f$	....	....
h.	$7y - 3 = x$	....	....



[2] Choose the correct answer:

(1) In the equation: $x = 3y - 7$, the dependent variable is ....
ⓐ x ⓑ 4 ⓒ y ⓓ 3

(2) In the equation: $9a - 31 = b$, the independent variable is ....
ⓐ 9 ⓑ a ⓒ 31 ⓓ b

(3) The equation that represents "8 more than s equals t" is ....
ⓐ $8s = t$ ⓑ $8t = s$ ⓒ $8 + s = t$ ⓓ $8 + t = s$

(4) The equation that represents "m equals the product of n and 3" is ....
ⓐ $m = 3n$ ⓑ $m = 3 + n$ ⓒ $n = 3m$ ⓓ $n = 3 + m$

(5) The equation that represents "4 times h added to 7 equals k" is ....
ⓐ $7h + 4 = k$ ⓑ $7k + 4 = h$ ⓒ $4h + 7 = k$ ⓓ $4k + 7 = h$

(6) The equation that represents "f equals the sum of adding 11 to the product of 8 and e" is ....
ⓐ $e = 8 + 11f$ ⓑ $e = 11 + 8f$ ⓒ $f = 8 + 11e$ ⓓ $f = 11 + 8e$

[3] Read and answer:

Popcorn Equation Think about a relationship between the food you want to buy and the amount of tokens you want to spend. Suppose you are buying 1 box of popcorn for a friend and you are not sure what to buy for yourself. Determine what is known and what will change.



Select two variables to write an equation for the total amount of tokens you will spend at the food stand and explain what each part of the equation represents.

....



[4] Write each statement as an algebraic equation:

(1) 9 more than y equals x ....

(2) 20 more than z equals h ....

(3) k increased by 9 equals f ....

(4) y equals the sum of eleven and x ....

(5) Three times k equals n ....

(6) h equals the product of 3 and d ....

(7) n equals thrice m increased by 12 ....



[5] Write each equation as a verbal phrase:

(1) $k = 20p$ ....

(2) $x = 4 + y$ ....

(3) $w + 12 = z$ ....

(4) $m - n = 3$ ....

(5) $x + y = 10$ ....

(6) $k - 2 = h$ ....

Lesson (3) Analyzing the Relationship Between Dependent and Independent Variables

Use the equation $y = 3x$ to answer these questions.

A. Which variable represents the input number?

B. Which variable represents the output number?

C. Which is the dependent variable?

D. Which is the independent variable?



Write an Equation Use the variables x and y, where x is the independent variable. Write the equation for "multiply by 3 and add 4." Select the correct answer.

A. $x = y + 3x + 4$ **B.** $x = 3y + 4$ **C.** $y = 3x + 4$ **D.** $y = -3 + 4x$



Equation from a Table Use variables x and y to write the equation for each of the tables.

A.

x	0	4	8	12
y	4	8	12	16

B.

x	12	20	8	4
y	7	11	5	3



Evaluate each of the following for x = 4

a. $y = \frac{1}{2}x + 2$

____

b. $y = 3x + 1$

____



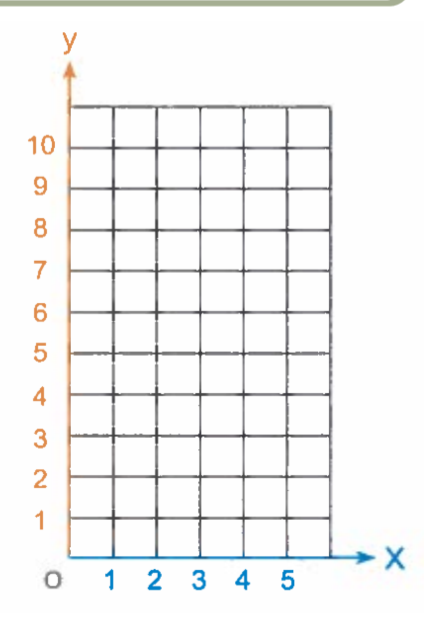
Lesson (4)

Graph Presentation for Dependent and Independent Variables

Write an equation.
Use the variables x and y, where x is the independent variable.
Write the equation "multiply by 3 and add 4" and substitute x by 0, 1
and 2 to evaluate y and record your results in a table, then represent the table on a graph.

....

....

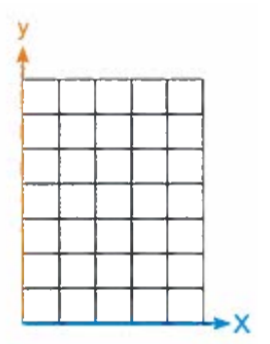




Complete the following tables then make the graph:

The equation : $y = x + 1$

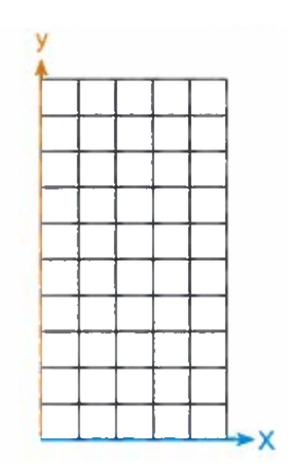
x	0	1	2
y	....	....	....
(x , y)	(0 , ...)	(1 , ...)	(2 , ...)





The equation : $y = 2x$

x	1	3	5
y	....	....	....
(x , y)	....	....	....





Homework

[1] Evaluate each of the following for x = 2:

(1) $y = 2x$ ....

(2) $y = x + 3$ ....

(3) $y = x - 1$ ....

(4) $y = x + 8.5$ ....

(5) $y = 4x - 5$ ....

(6) $y = 2x + 3$ ....

(7) $y = 5x + 30$ ....

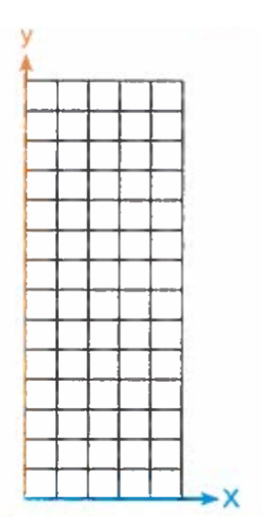
(8) $y = 7x + 2.3$ ....



[2] Complete the following tables then make the graph:

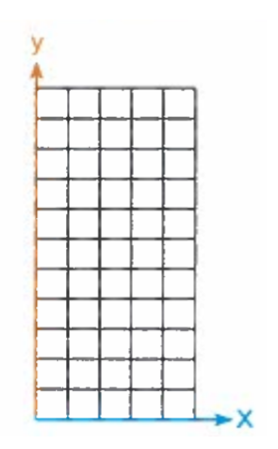
The equation : $y = 2 + 3x$

x	1	2	3	4
y	......	......	......	......
(x , y)	......	......	......	......



The equation : $y = 2x + 1$

x	0	2	3	5
y	......	......	......	......
(x , y)	......	......	......	......





Unit (5) Assessment

[1] Choose the correct answer:

(1) Which of the following is an equation?

a) 20 x + 1.3 b) 3 + a c) Twice x d) f = k + 9

(2) In the equation: $y = 1 + \frac{x}{2}$, if x = 8, then y = ...

a) 1.5 b) 4 c) 4.5 d) 5

(3) The independent variable in the equation a = 3 b + 1 is ....

a) a b) 3 c) b d) 1

(4) k equals the product of h and 8 in equation is ....

a) k = 8 h b) k = 8 + h c) h = 8 k d) h = 8 + k

(5) If (2 , a) satisfies the equation y = 3 x + 1, then a = ...

a) 5 b) 6 c) 7 d) 8

(6) The dependent variable in the equation s = 7 t – 15 is ....

a) s b) t c) 7 d) 15

(7) r equals nine times p added to 17 in equation is ....

a) 17 = 9 p + r b) 9 p = r + 17 c) 9 r = p + 17 d) r = 9 p + 17

[2] Complete:

(1) In the equation: t = 7 r and r = 2, then t = ...

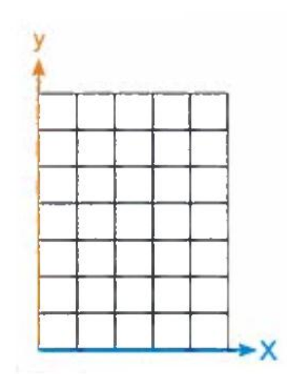
(2) "e equals f increased by 2.5" in algebraic equation is ....

(3) (4 , ...) satisfies the rule $y = \frac{1}{2}x + 4$.

[3] Complete the table which satisfies the following equation, then graph:

y = 3 x + 1 and represent it

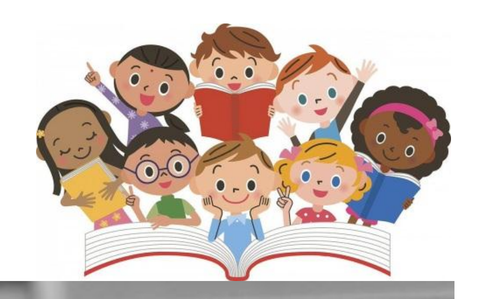
x	0	1	2
y			
(x , y)			











UNIT
6

Theme 2 | Mathematical Operations and Algebraic Thinking: Statistics and Data Analysis

Data Distributions



Lesson (1) Data and Statistical Questions

Statistical questions	Non statistical questions
It's a question has possible different answers. **Ex:** How old are the students in your class?	It's a question has we get only one answer. **Ex:** How old are you?



[1] Write statistical or non-statistical:

(1) How tall are the students in your class? ....

(2) What was the highest temperature in Cairo today? ....

(3) What color's hat is Hoda wearing? ....

(4) How many siblings do students in your class have? ....



Types of statistical questions

A numerical statistical question	A categorical statistical question
The result is numerical (quantitative) data	The result is descriptive data

[2] Write numerical or categorical:

(1) How many pets do the students in your class have? ....

(2) What color hair do students in your class have? ....

(3) What types of fruits do students in your class like best? ....

(4) How many siblings do the students in your class have? ....

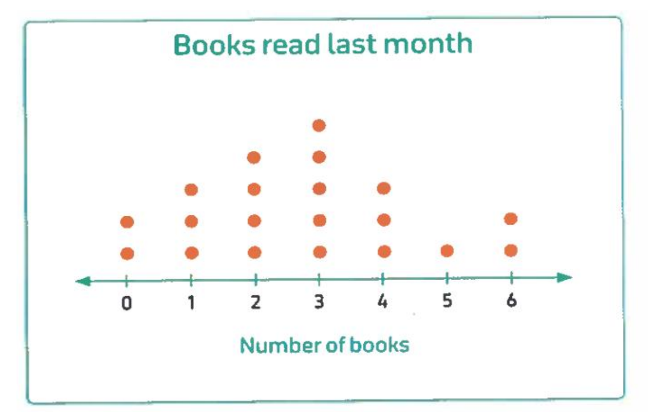
(5) How many apps do the students in your class have on their phones? ....





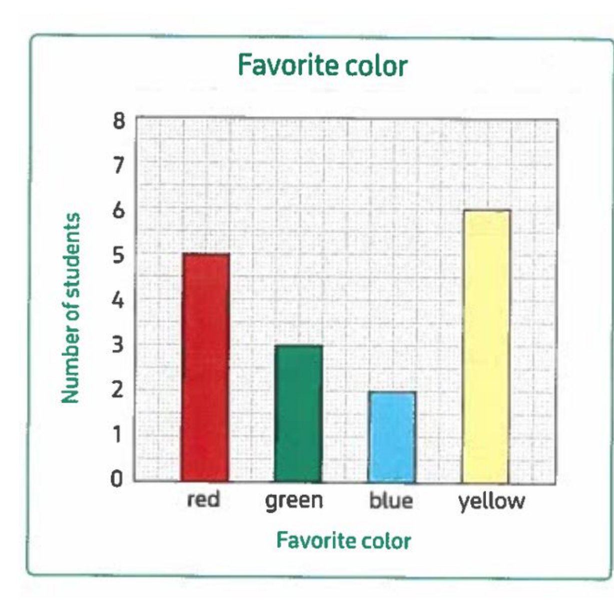
Lesson (2) Lesson (3)

Exploring the Histogram
Representing Data Using Histograms



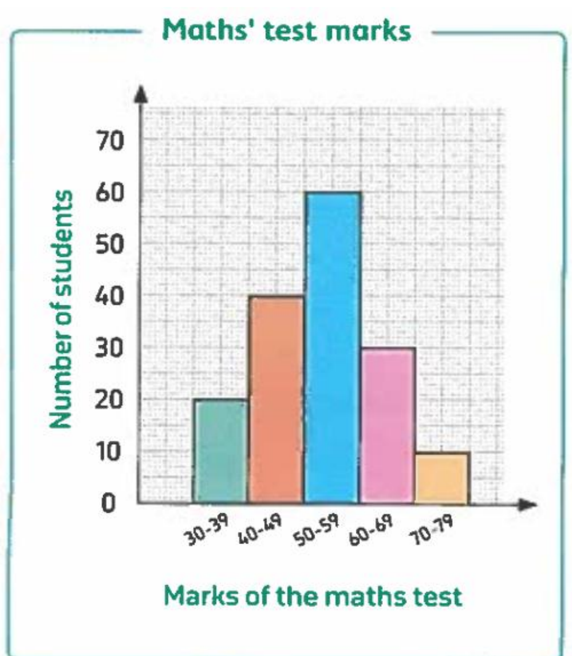
Characteristics of dot plot

1. Title.
2. Shows numerical data.
3. Each individual data is represented by a dot above the number line.
4. The number line is labeled with the units used to measure the data.



Characteristics of bar graph

1. Title.
2. Two axes :
   - Horizontal axis to represent data which can be anything.
   - Vertical axis has a scale.
3. Labels for each axis.
4. Shows categorical data.
5. Bars represent data.
6. Each bar represents one category or one value.
7. Equal gaps between bars.
8. Bars can be rearranged.

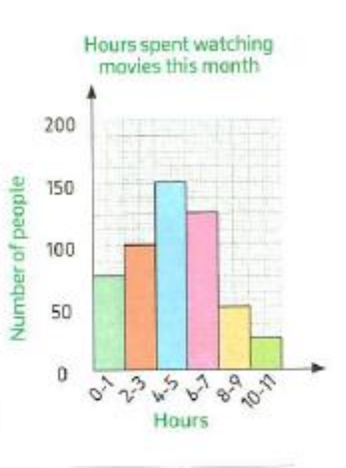


Characteristics of histogram

1. Title.
2. Two axes :
   - Horizontal axis to represent data grouped in intervals (classes).
   - Vertical axis has a scale.
3. Labels for each axis.
4. Shows numerical data.
5. Bars represent data.
6. No gaps between bars (unless data are not given in a specific interval).
7. Bars should not overlap.
8. Bars can not be rearranged.



From the opposite histogram answer the following questions :



a. How many people are surveyed ?

b. What is the frequency in the hours interval [6 - 7] ?

c. How many people in the hours interval [2 - 5] ?

d. Which hours interval has the maximum number of people ?

e. How many people spent watching movies 8 hours or more ?

f. How many people spent watching movies less than 4 hours ?



The following data represents the marks of 20 students in Math test.

13	11	11	12	13	12	14	13	12	12
13	15	11	14	14	11	13	12	15	13

a. Form the frequency table. **b. Represent the data using the bar graph.**

Solution

Range = ...

Marks	Tallies	Frequency
11		
12		
13		
14		
15		



The following data represents the weights of 24 children in kilograms.

12	30	27	15	27	21	16	33	14	22	15	21
13	23	26	24	22	28	34	15	14	16	21	27

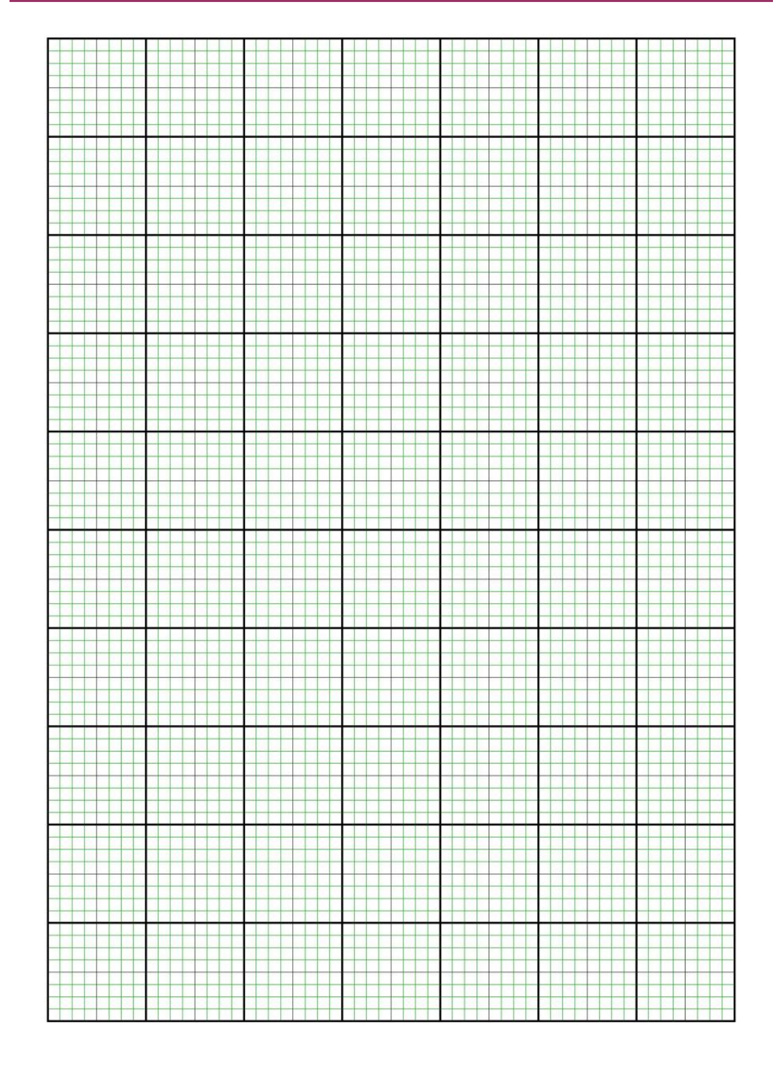
b. Form the frequency table.

c. Represent the data using the histogram.

Solution

Range = ...

Intervals	Tallies	Frequency
10 – 15		
16 – 20		
21 – 25		
26 – 30		
31 – 35		





Lesson (4) Exploring Box Plot

Median is the middle value of set of values after arranging it.

To find median after arranging if the number of values are

Odd

The median lying in middle exactly.

If the values are

31 , 24 , 64 , 19 , 57

After arrange :

19 , 24 , (31), 57 , 64

Then median is 31

Even

The median = $\frac{\text{sum of two middle values}}{2}$

If the values are

32, 24, 64, 19

After arrange:

19, 24, 32, 64

Then median = $\frac{24 + 32}{2} = 28$

Lower quartile (Q1)

It is the middle value of the lower half of the set values.

Upper quartile (Q3)

It is the middle value of the upper half of the set values.



Example:

Arrange the values ascendingly, then find median of values, Q1 and Q3

13 , 8 , 7 , 4 , 8 , 12 , 7 , 6 , 1 , 3 , 2

Median = ...

1 , 2 , (3), 4 , 6 , (7), 7 , 8 , (8), 12 , 13

Q1 = ...

Q3 = ...





This data shows the number of books read by a group of students.

- Fill in the information and use it to draw a box plot on the number line below to show these results.

Books read	13	12	9	11	10	12	8	15	9	10	7	5

Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range



This data shows the number of points scored per game by a group of basketball players.

- Fill in the information and use it to draw a box plot on the number line below to show this data.

Points scored	23	18	20	27	22	15	29	21	22

Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range

This data shows the temperatures from different states on the same day.



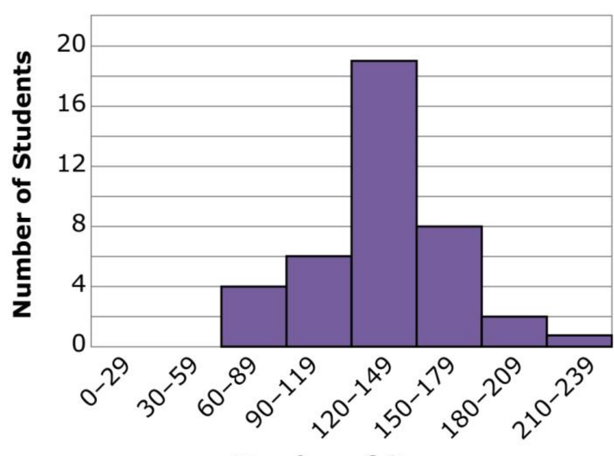
- Fill in the information and use it to draw a box plot on the number line below to show these results.

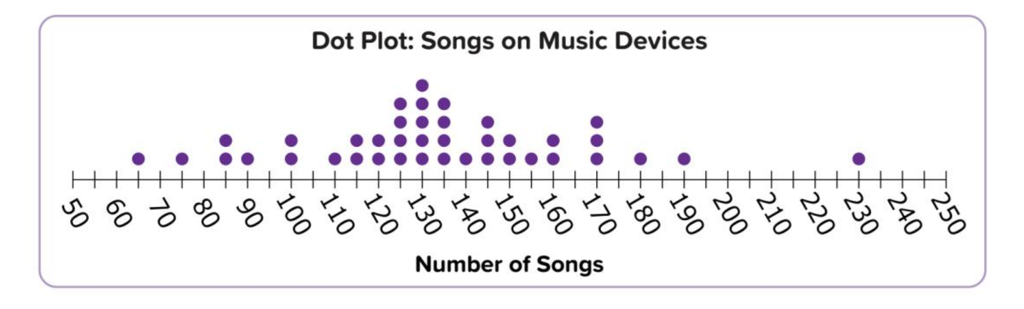
Temperature	55°F	52°F	41°F	45°F	75°F	57°F	42°F	48°F	63°F	39°F

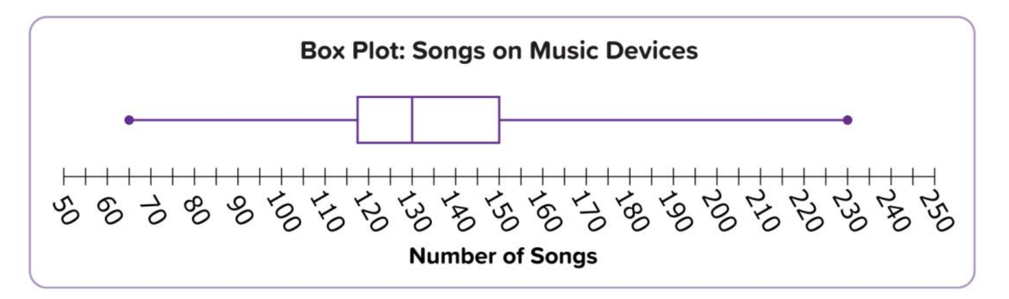
Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range



Lesson (5) Applications on Data Representations







Histogram Which of the following questions could be answered using the histogram? Identify all that apply.

A. What is the most common interval for the number of songs?

B. How many students are represented in the data?

C. How many students had 180 songs or more on their music devices?

D. How many students had exactly 120 songs on their music devices?

E. What was the greatest number of songs a student had?

F. How many students had from 90 to 179 songs?



Unit (6) Assessment

[1] Choose the correct answer:

1. Which display makes it easier to see the median ?
   A. histogram B. box plot C. dot plot D. bar graph

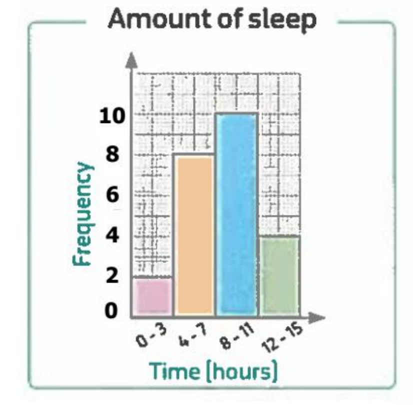
2. The median of the values 9 , 4 , 8 , 1 and 3 is ....
   A. 3 B. 4 C. 5 D. 8

3. From the opposite box plot the difference between the upper quartile and the lower quartile = ...

   22 24 26 28 30 32 34 36

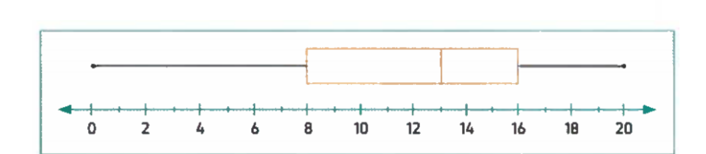
   A. 3 B. 29 C. 31 D. 32

4. The opposite histogram shows the number of hours that the students in your class slept last night. How many students slept at least 8 hours ....
   A. 11
   B. 14
   C. 17
   D. 19



5. An interval frequency table with class intervals of equal sizes using 60-69 as one of the class interval in constructing the following data : 63 , 70 , 80 , 83 , 94 ,72 , 66 , 68 , 98 , 78 , 87 , 65 , 93 , 77 , 80 , 85 , 78 , 70 , 62 , 81 , 74 , 83 , 66 , 76 , 88 , then the frequency of the class 70 - 79 is ....
   A. 6 B. 7 C. 8 D. 9

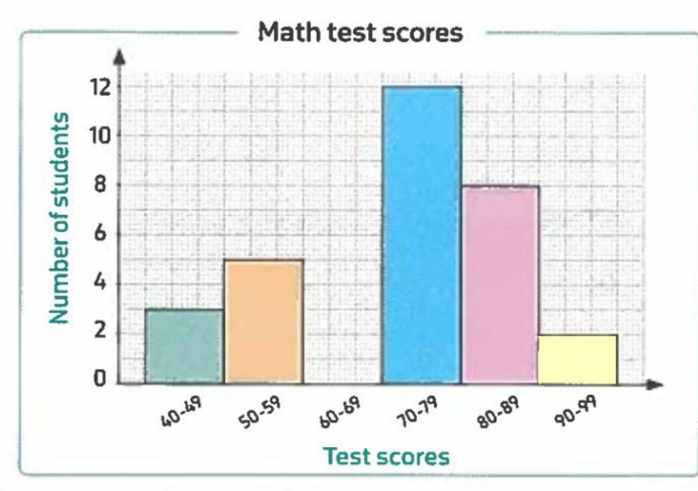
6. From the opposite box plot the median = ...
   A. 8 B. 12
   C. 13 D. 16



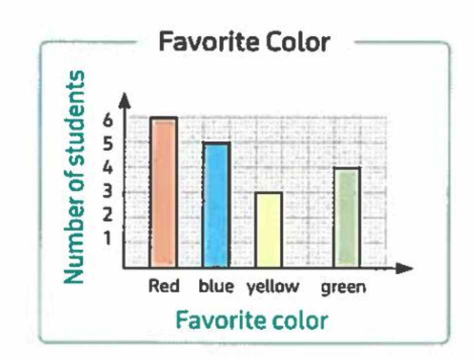


[2] Complete:

1. The median of the values 3 , 7 , 2 , 9 , 5 and 11 is ....
2. The types of statistical questions are .... and ....
3. The shape shows the set of data in form of intervals is ....
4. The upper quartile of the values : 5 , 6 , 11 , 10 , 1 and 3 is ....
5. The opposite histogram shows the distribution of scores of 30 students on a math test If the score of success is 50 or more, then the number of failed students is ....



6. We use .... graph to see exactly how many times each individual value occurs.
7. From the opposite bar graph : the number of students who did not prefer yellow color is ....



8. If the median of the values : k + 1 , k + 2 , k + 5 , k + 4 and k + 3 where k is a positive integer is 13 , then k = ...



[3] Answer the following question:

All dot plots have the following characteristics except ....

A. Dot plots should have titles.

B. Dot plots should have data graphed above a number line.

C. Each individual piece of data can be seen on a dot plot and is represented by a dot.

D. The number lines in dot plots should start at 0

2 , 16 , 14 , 3 , 6 , 8 , 10 , 13 , 9 , 2 , 11

- Fill in the information and use it to draw a box plot on the number line below to show this data.

Minimum value	1st quartile	Median	3rd quartile	Maximum value	Range



The following table shows the marks of a group of students in an exam :

Marks	1	2	4	5	7	8	10	11	12	14	15	16	17	18	19	20
Number of students	1	2	3	1	1	3	3	1	2	4	2	5	2	3	4	2

use a suitable intervals to represent these data by the histogram.

Range = ...

Intervals	Frequency

Determine whether the results from each question would give you numerical data or categorical data.

a. How many books did the students in your class read last month ?

____

b. What types of subjects do students in your class like best ?

____

c. How many pens do the students in your class have ?

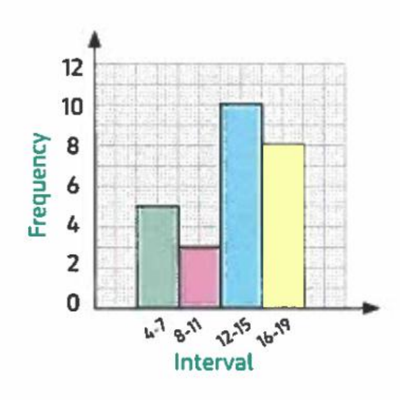
____



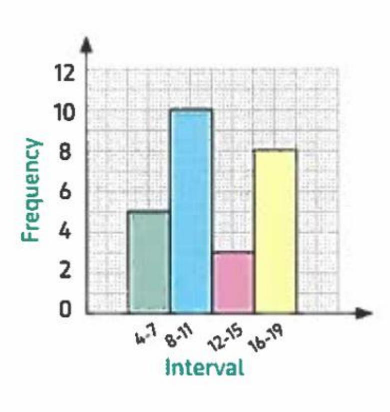
Which one of the following histograms represents the data in the opposite table ?

Interval	Frequency
4 – 7	8
8 – 11	3
12 – 15	10
16 – 19	5

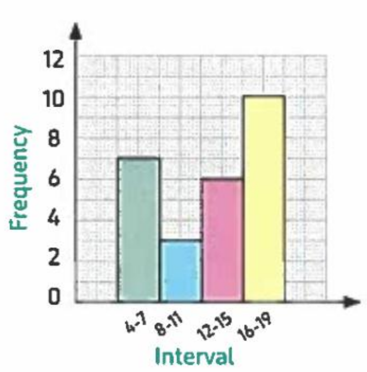
A.



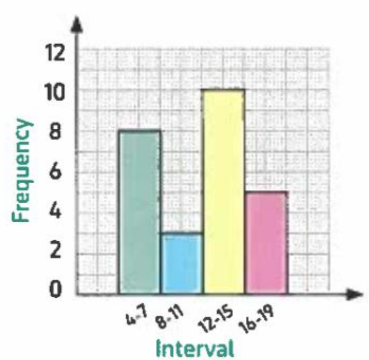
B.



C.



D.







UNIT 7

Theme 2 | Mathematical Operations and Algebraic Thinking: Statistics and Data Analysis

Measures of Center and Variation

Lesson (1) Exploring the Balance of Data Sets

Balance point of the data set is a way to find the average of the data

For Example :

Ashraf asks 7 of his friends "How many books did they own ?". Ashraf reports his findings as a list or a display such as **a dot plot** where each dot represents one response.

- **List :** 1 , 2 , 3 , 4 , 4 , 6 and 8

- Dot plot :

1 2 3 4 5 6 7 8

"Number of books"

Now : How can Ashraf find the balance point of this data ?

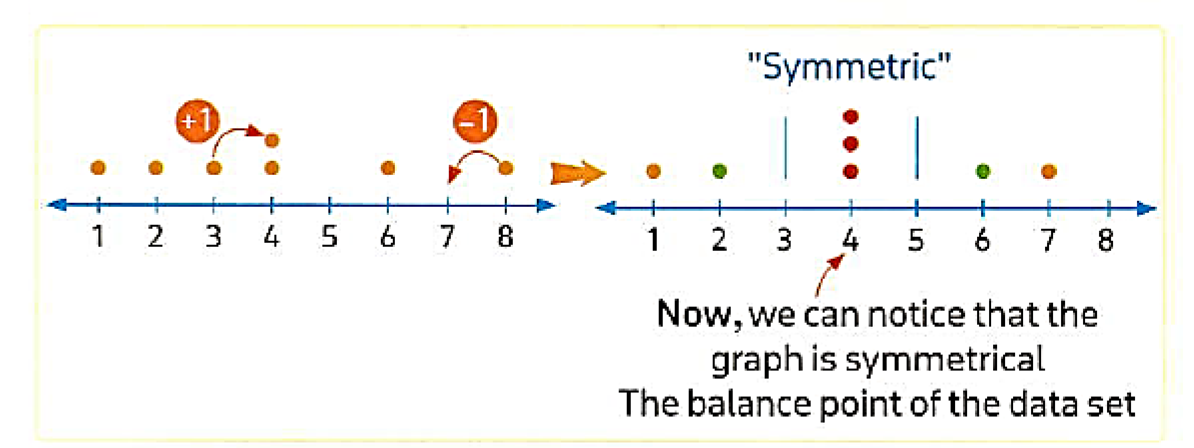
The sum of numbers in the list is : $1+2+3+4+4+6+8=28$

So, if we add one to any number of the list and subtract one from another number of the list, the sum is still 28

as : $\boxed{1+1}+2+3+4+4+6+\boxed{8-1}=28$

> **Note**
> You can add and subtract the same number

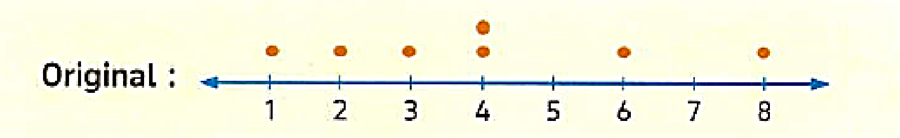
Finally, he can creat a new dot plot by moving the dots as a follow.



So, Ashraf find that "4" is the balance point of this data set.



Also Ashraf can find the balance point of this data by moving the dots.



Step 1

Step 2

Step 3

Step 4

Step 5

Step 6

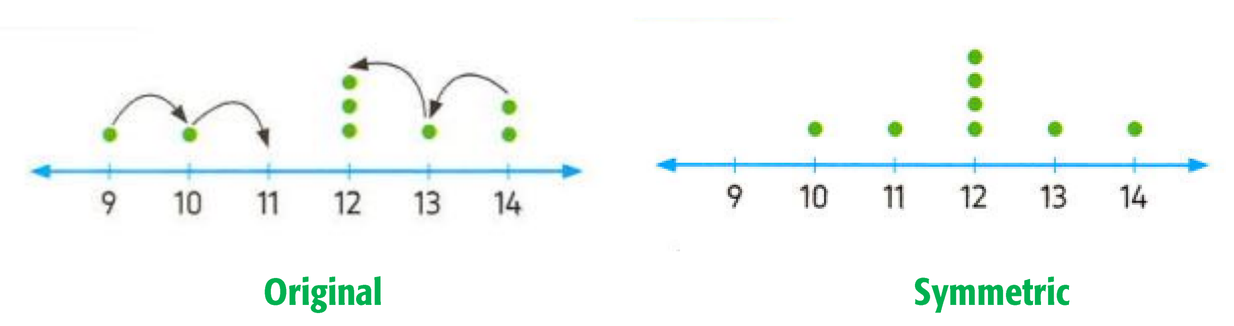
Last step

The balance point of the data set

So, Ashraf find that "4" is the balance point of this data set.

Ex: Find the balance point of the following data 13, 14, 14, 9, 10, 12, 12

First: **Second:**



Original **Symmetric**

The balance point of the data is 12



Lesson (2) Interpreting Arithmetic Mean

The mean is one measure of measuring central tendency

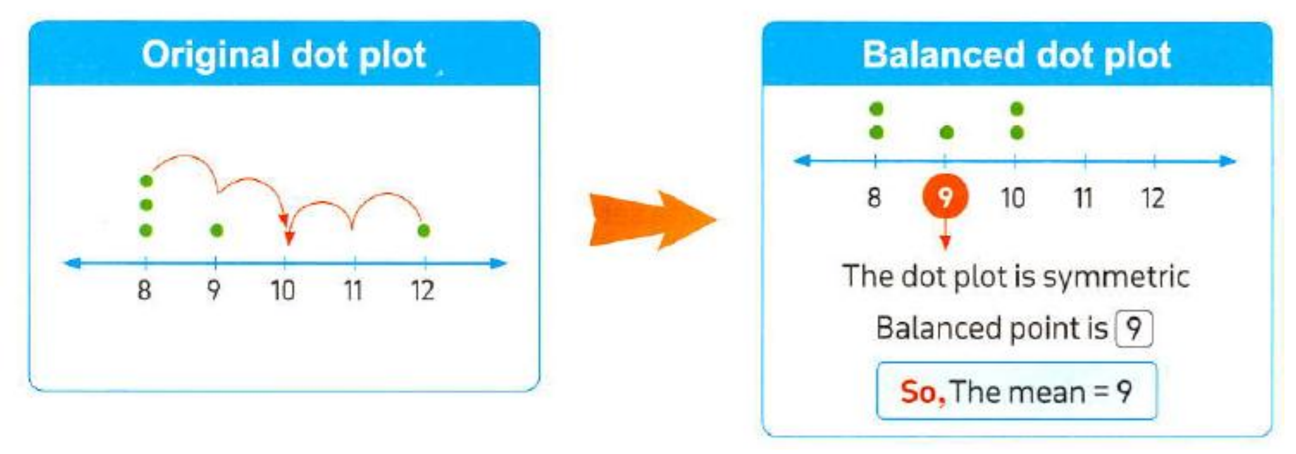
First: Mean as balance point:

For Example :

Suppose Hany asks his friends how many toys they own. Hany report his findings as a list of a data display such as a dot plot where each dot represents one response.

▶ List : 8 , 8 , 8 , 9 , 12

Now : How can Hany calculate the mean of this data set ?





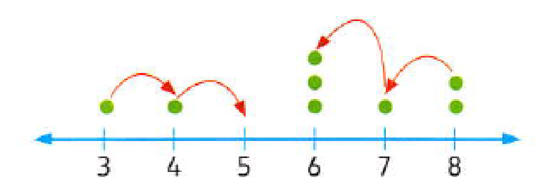
EX:

Calculate the mean of the following data using balanced point.

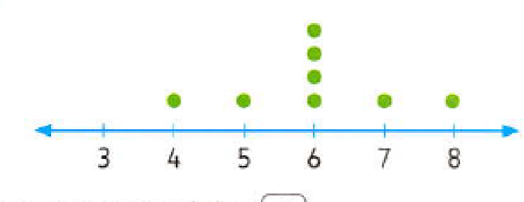
3 , 4 , 6 , 7 , 8 , 8 , 6 , 6

Solution

The original dot plot



The balanced dot plot



The Balanced point is 6

So, the mean = 6



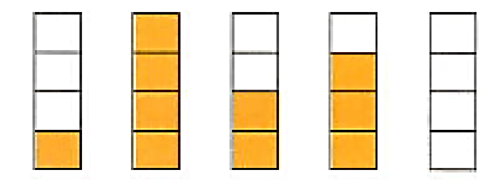
Second: Mean as fair share:

There are another way to find the mean as a fair share.

For Example :

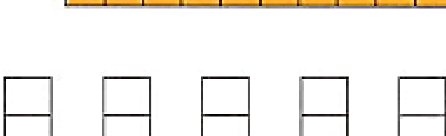
Suppose there are 5 bottles which have the following amounts of water :

1 liter , 4 liters , 2 liters , 3 liters and 0 liters.



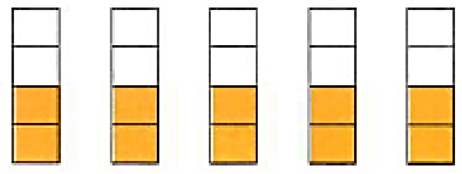
To find the mean, first we add up all of the values.

We can think of as putting all of the water together : $1 + 4 + 2 + 3 + 0 = 10$



To find the "fair share" we divide the 10 liters equally into the 5 bottles : $10 \div 5 = 2$

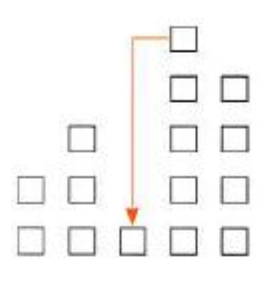
Then, the mean = 2 liters

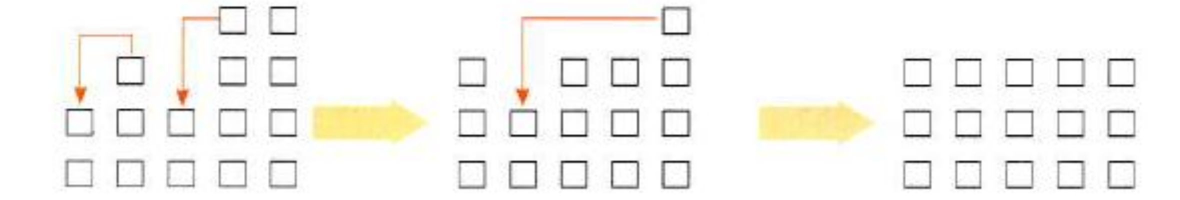




Find the mean of 2 , 3 , 1 , 5 and 4 (using the fair share).

Solution





So, the mean = 3



Third: Mean as Rule:



$$\text{Mean} = \frac{\text{Sum of the values}}{\text{The number of values}}$$

EX:

Calculate the mean by using the rule for each of the following :

3 , 9 , 5 , 16 , 7

Solution

The rule: $\text{The mean} = \frac{\text{sum of the values}}{\text{the number of values}}$

$$\text{The mean} = \frac{3+9+5+16+7}{5} = \frac{40}{5} = \boxed{8}$$

[1] Calculate the mean of each of the following data by using the rule:

(1) 3, 4 ....

(2) 6, 10 ....

(3) 18, 6, 18 ....



The missing value in a set of data

The missing value = [The number of values X The mean] -[The sum of given values]

EX:

Find the value of x .

3 , 7 , x , 8 if the mean = 5

Solution

Value of x = [The number of values × the mean] − [The sum of given values]

$x = [4 \times 5] - [3 + 7 + 8] = 20 - 18 = 2$

EX: **Find the value of x in each of the following:**

(1) 8, 6, x, 5 Mean = 5 ....

(2) 4, x, 19 Mean =10 ....

(3) 12, 21, x, 8 Mean =15 ....



Exercises

[1] Choose the correct answer:

(1) The mean of 3, 4, 5 is ....
ⓐ 4 ⓑ 5 ⓒ 3 ⓓ 12

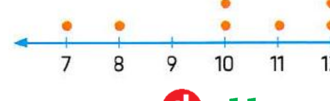
(2) The mean of the data set = ...
ⓐ 4 ⓑ 22 ⓒ 5 ⓓ 5.5

(3) The mean of the set of data 3, 6, 4, 9 is ....
ⓐ 9 ⓑ 8 ⓒ 72 ⓓ 4

(4) If The sum of marks of 8 students is 48, then the mean for their marks = ...
ⓐ 8 ⓑ 6 ⓒ 12 ⓓ 48

(5) The mean of data set 8, 10, 12 is ....
ⓐ 12 ⓑ 8 ⓒ 10 ⓓ 30

(6) From the opposite dot plot, the mean is ......

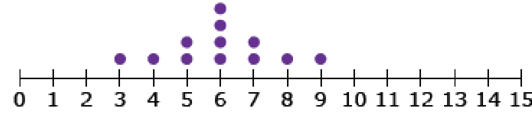


ⓐ 7 ⓑ 8 ⓒ 10 ⓓ 11

(7) The mean of the values 5, 6, 0, 4 is ....
ⓐ 20 ⓑ 4 ⓒ 5 ⓓ 6

(8) If the sum of marks of 3 students in Math test is 36 ,The mean of students marks is ....
ⓐ 36 ⓑ 3 ⓒ 12 ⓓ 39

(9) In the opposite line plot, the balance point is ....



a 42 b 6 c 3 d 9

(10) Which set has the greatest mean? ......

a 1, 2, 4, 2, 1 b 8, 7, 3 c 10, 5, 15 d 6, 9

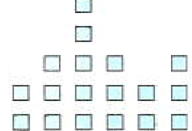
(11) The mean of 16.5, 18.9, 16.5 and 14.6 is ....

a 16.6 b 16.7 c 16.62 d 16.625

(12) The balance of the data set 21, 22, 24, 24, 25, 26 and 26 is ....

a 26 b 25 c 24 d 22

(13) The mean of the represented data is ....



a 2 b 3 c 4 d 5

(14) If the mean of the side length of a triangle is 8 cm, then the perimeter of the triangle is ....

a 8 cm b 18 cm c 24 cm d 15 cm

(15) If the mean of the ages of Mariam and Joudy is 7 years and the age of Mariam is 8 years , Then the age of Joudy is .... years

a 6 b 7 c 8 d 15

(16) The mean of the marks of 5 students is 20 marks, then the sum of there marks = ... marks

a 4 b 15 c 25 d 100



[2] Complete:

(1) The mean of the values 4, 3 and 5 is ....

(2) The mean of the values 1, 2, 3, 4 and 5 is ....

(3) The average of the values 20, 20, 20 and 20 is ....

(4) If the mean of the numbers 3, 5, x is 4, then x = ...



Essay questions

[1] The opposite table represents Omar's Marks in Maths test within 5 months.

Months	September	October	November	December	January
Marks	25	30	25	30	30

Find the mean of Omar marks.



[2] The opposite table represents number of Sirag's studying hours in 6 days. Calculate the mean of number of hours.

Day	Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday
Number of hours	8	5	5	6	6	4



[3] The opposite table represents number of books that Joudy's reads in 6 days. Calculate the mean of number of books.

Day	1st day	2nd day	3rd day	4th day	5th day	6th day
Number of hours	2	3	4	1	2	2



[4] The set of data 11, 4, 3, 10 represent the number of goals that Yassin scored in handball matches. Calculate the mean of the number of goals.



[5] If the temperature degrees for a week in December are 25°, 27°, 31°, 23°, 22° and 18° Calculate the mean of these degrees.



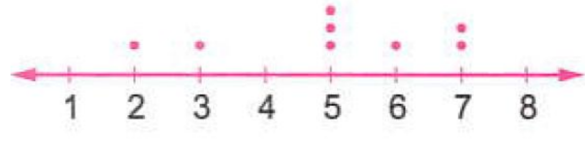
Homework

[1] Choose the correct answer:

(1) The balance point of the data set 5, 6, 8, 8, 8, 9, 10 and 10

ⓐ 5 ⓑ 7 ⓒ 8 ⓓ 10

(2) The mean of the opposite data = ...



ⓐ 4 ⓑ 5 ⓒ 6 ⓓ 7

(3) If the mean of the values 10, 13, 17, x, 10 is 11 then x equals ....

ⓐ 10 ⓑ 5 ⓒ 13 ⓓ 11

(4) The mean of the data set 5, 9, 3, 16 and 7 is ....

ⓐ 16 ⓑ 7 ⓒ 9 ⓓ 48

(5) The mean of data set 8, 10, 12 is ....

ⓐ 12 ⓑ 8 ⓒ 10 ⓓ 30



[2] Complete:

(1) The average of the values 15, 15, 15, 15 is ....

(2) The sum of six numbers is 36 , Then the mean of these numbers is ....

(3) The balance point of the following data set 11, 12, 14, 14, 15, 16, 16 is ....

(4) The mean of the values 13, 14, 10, 13 and 10 is ....

(5) If the mean of the values 2, x, 7 is 5 , Then x = is ....

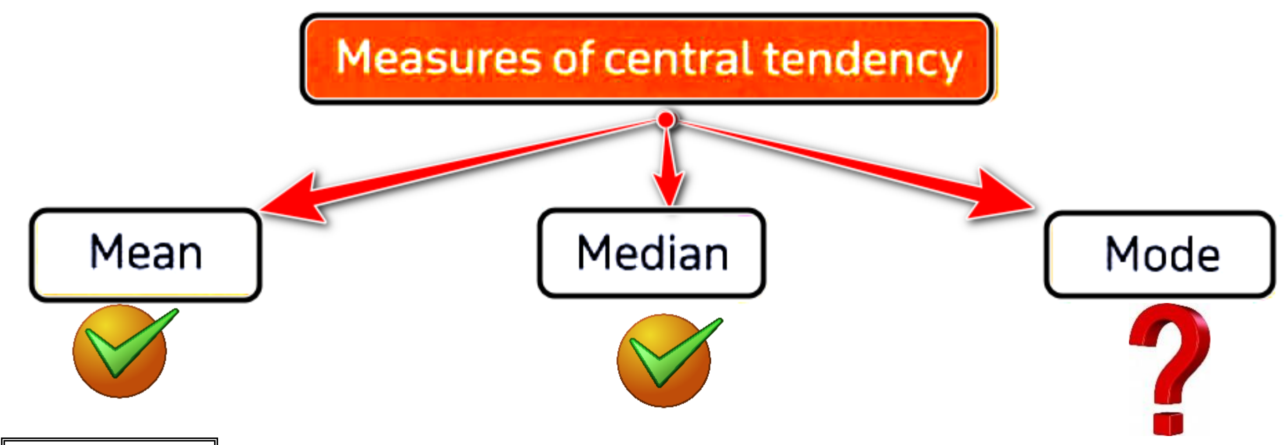


[3] If the number of goals registered by a football team in 6 matches are 3, 2, 0, 6, 1 and 6. Calculate the mean of the number of goals



[4] If the heights of 4 trees are 14 dm, 7dm, 9dm and 6 dm. Determine the mean of the trees heights

Lesson (3) Exploring Median, Mode and Outliers



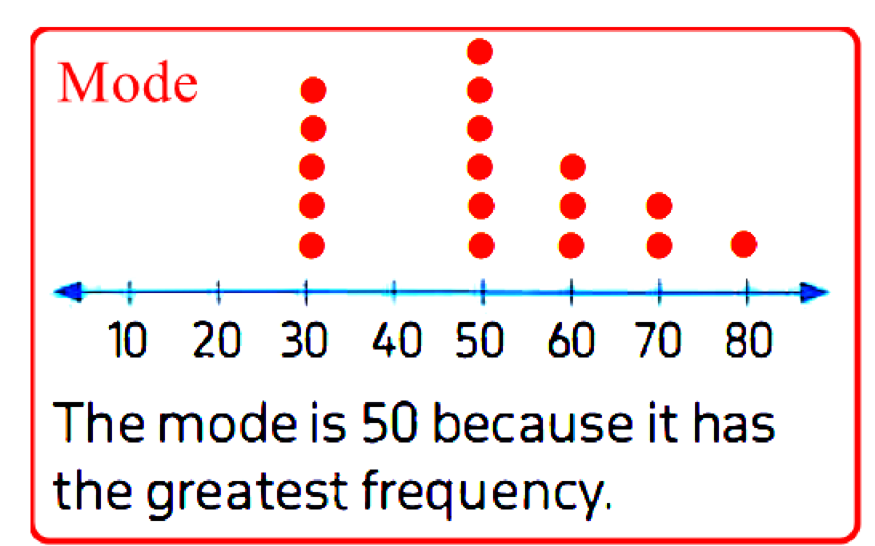
The Mode:

The mode of a set of data is the most common (frequent) value in the set.

Example (1): Mode in the values 5,3,8,9,8,12 is 8.

Example (2): Mode in the values 3, 7, 2, 1, 3, 7, 8 is 3 and 7.

Example (3): there is no mode in the values 8, 3, 9, 5, 4, 2, 10, 0



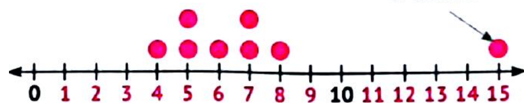
Check :

Find : mode for. The set of data 19 ,3 ,5 ,7 ,4 ,5 ,6

Outlier:

Outliers are values that "lie outside" (is much smaller or larger than) most of the other values in a set of data.

Example (1): Values: "7, 6, 5, 8, 7, 4, 15, 5", **15** is called an outlier.





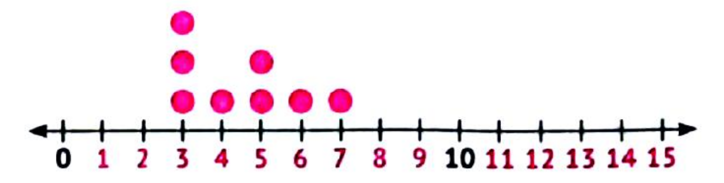
Example (2): Values: "12, 15, 2, 1, 10, 15, 13, 11" **1** and **2** are called outliers.





Example (2): Values: 6, 3, 7, 5, 3, 5, 4, 3". There are no outliers.

- Because all values are close to each other.





Chose the correct answer:

(1) The outlier value of the following data set is ________ (24 , 25 , 21 , 22 , 7 , 21 , 23)

(a) 25 (b) 24 (c) 21 (d) 7

(2) The mode of the following data set [3 , 4 , 5 , 3 , 5 , 7 , 5 , 9 , 5 , 2] is ________

(a) 3 (b) 5 (c) 7 (d) 9

(3) The mode of 7 , 9 , 7 , 8 , 7 , 6 , 7 and 10 is ________

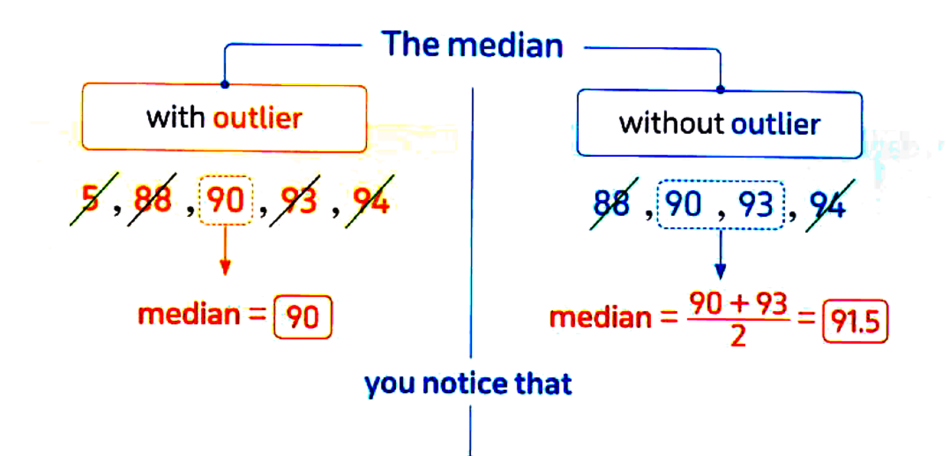
(a) 7 (b) 8 (c) 9 (d) 10



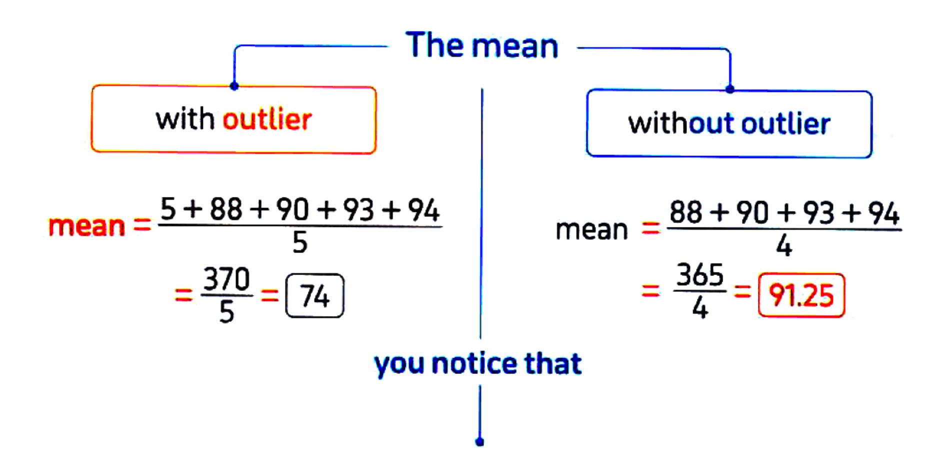
How the outlier affects the median and the mean of the following quiz scores?

5 88 90 93 94

- The outlier is 



The outlier has weak effect on the median



The outlier has great effect on the mean





The mean **is affected by** outliers in the data set.

The mean
- increases if the outliers are greater than the other values.
- decreases if the outliers are less than the other values.

The median **is not affected by** outliers in the data set.



Remarks

1. If the outlier values are smaller than the other values, then the outlier decreases the mean.
2. If the outlier values are greater than the other values, then the outlier increases the mean.
3. The more number of outliers, the more effect on the mean.



Which is better to use [Median or Mean] for dot plot graph ?

a. If the dot plots are distributed in one side of the graph



The median is better

b. If the dot plots are distributed evenly on the two sides of the graph without symmetry



The mean is better

c. If the dot plots are distributed symmetrically on the graph



Either mean or median

Don't forget : In case of outlier the median is better.



[1] Find the mode of each of the following:

(a) 7, 6, 4, 8, 2, 5, 11, 4 ………………

(b) 6, 2, 5, 6, 4, 1, 6, 2, 9 ………………

(c) 21, 26, 26, 29, 29, 29, 31 ………………



[2] Select the outlier in each of the following data set:

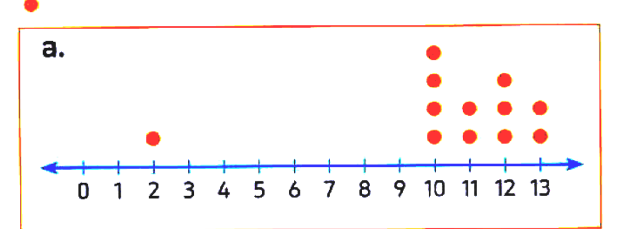
(a) 1, 3, 2, 5, 4, 76, 6, 7, 9, 8.

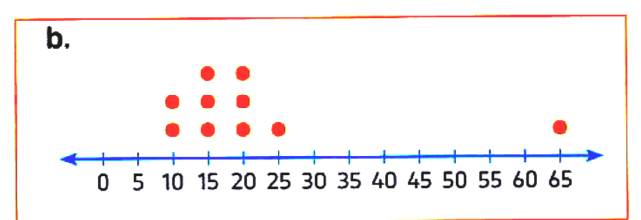
(b) 6, 2, 5, 6, 4, 1, 6, 2, 9.

(c) 101, 103, 105, 102, 107, 106, 2000, 104.



3. Match each dot plot graph with the related description about affecting the outliers on the mean.



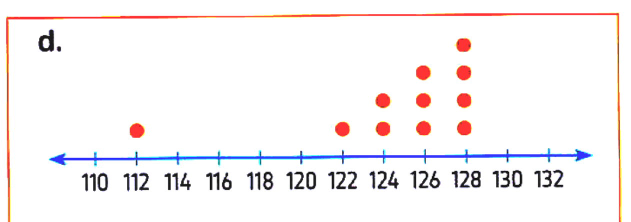


Mean stays the same

Mean increases

Mean decreases







4. Complete.

A ______ are values that lie away the other values.

B The outlier value of the data set {7 , 46 , 48 , 49 , 50 , 51 , 52} is ______

C The two outlier values of this data set {31 , 205 , 207 , 200 , 201 , 206 , 202 , 209 , 1,000} are ______ and ______

D ______ is the measure of central tendency changed more with the outlier.

E The better measure of central tendency for data set with outlier value is ______

F ______ is the better measure of central tendency for data set with no outlier value.

G The ______ is the value that occurs most often.

H The mode of {7 , 10 , 15 , 7 , 10 , 13 , 7 , 15 , 7} is ______



Homework

[1] Choose the correct answer:

(1) Mode is the ______ of the data.

ⓐ most occurs value ⓑ middle value ⓒ average value ⓓ none of these

(2) A set of values with two modes are called ______

ⓐ bimodal ⓑ trimodal. ⓒ multimodal. ⓓ non-modal.

(3) The mode of 5 , 3 , 10 , 4 , 11 , 3 is ______

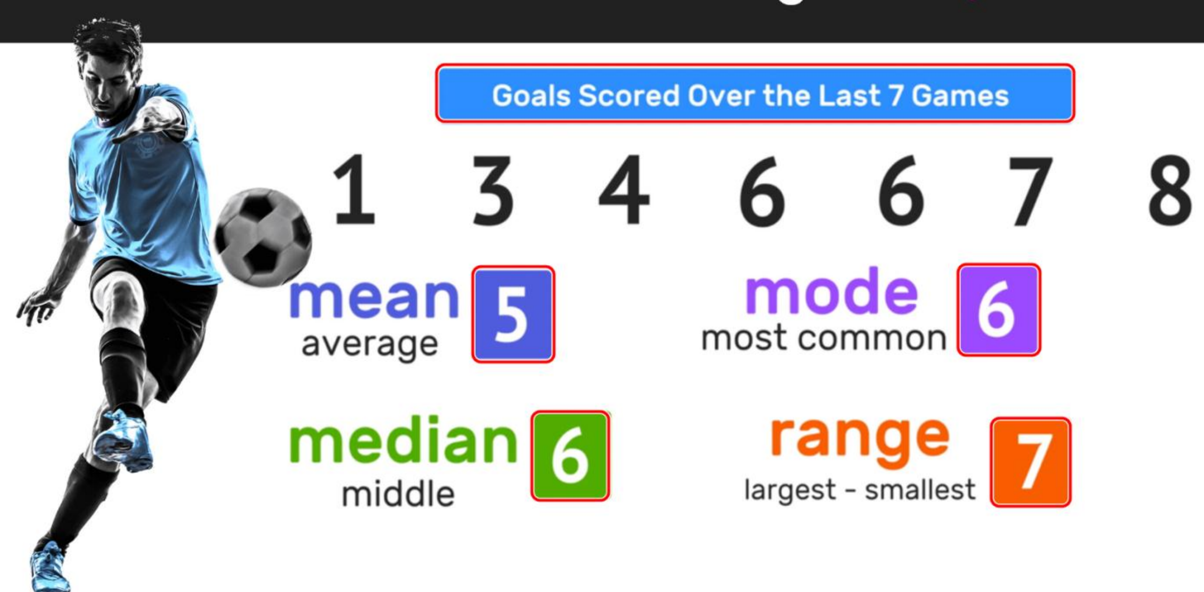
ⓐ 3 ⓑ 4 ⓒ 5 ⓓ 10

(4) The outlier value of the following data set is ______

75	73	74	71	7	72	70

ⓐ 7 ⓑ 70 ⓒ 71 ⓓ 75

Lesson (4) Exploring the Range

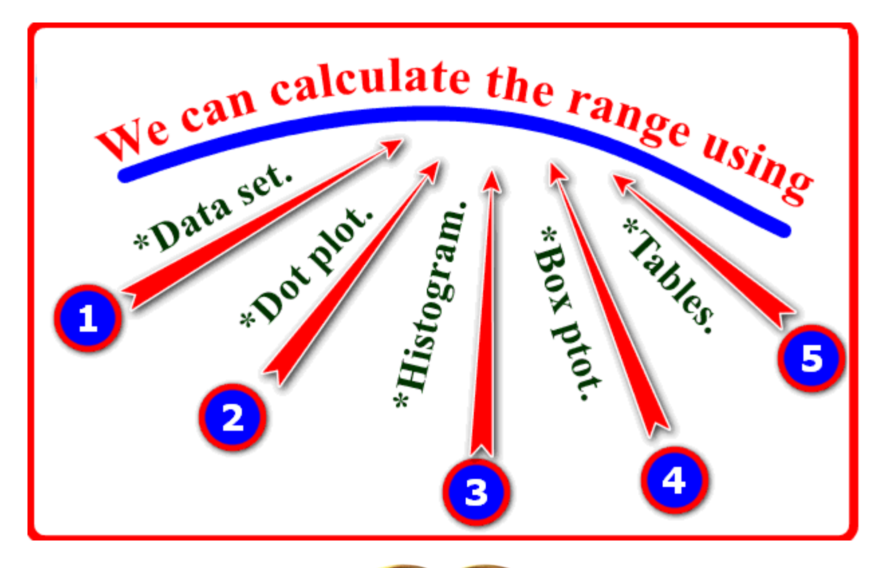




The range :

The range of the data is **the amount of spread** among all the data collected. This value is calculated by finding the **difference between the maximum and minimum** data values.

For Example: The range of the set of values 9 ,4 ,6 ,1 ,7 is **9 – 1 = 8**



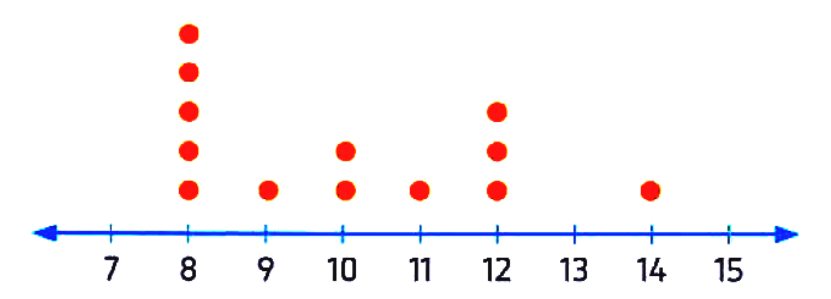


1. Find the range of each of the following:

(1) The data set of values 6 ,7 , 5 , 1 , 9 ,12 , 3 ,4 ....

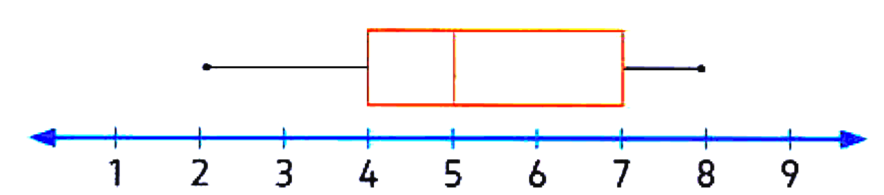


(2) The dot plot Rang = ...





(3) The Box plot . Rang = ...



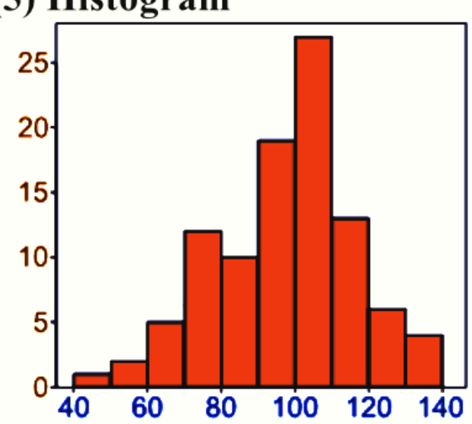


(4)table:

Age of student	Number of students
9	50
10	63
11	41
12	99
13	75

Rang = ...

(5) Histogram



Rang = ...



Choose the correct answer:

(1) The range = greatest value..... smallest value.

ⓐ + ⓑ − ⓒ × ⓓ ÷

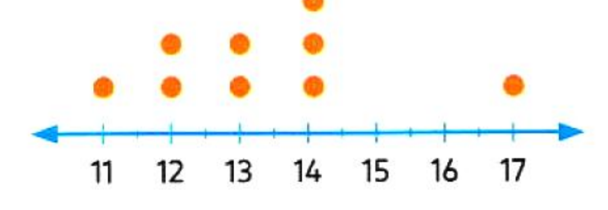
(2) The range of the set of values 7 , 3 , 6 , 9 and 5 is ___

ⓐ 3 ⓑ 5 ⓒ 4 ⓓ 12

(3) If the values of data set start from 30 to 60, then the range of this data = ___

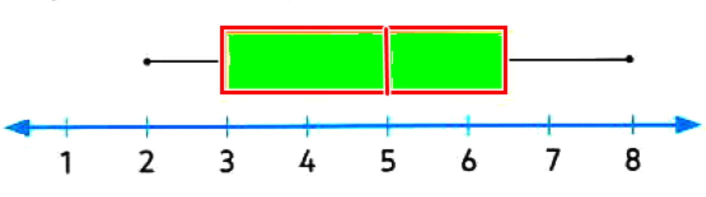
ⓐ 20 ⓑ 30 ⓒ 60 ⓓ 90

(4) The range of data set represented by the following graph is ___



ⓐ 7 ⓑ 6 ⓒ 11 ⓓ 17

(5) By using the following box plot, the range = ___



ⓐ 3 ⓑ 5 ⓒ 6 ⓓ 7

(6) The range of the quiz scores ?

Quiz number	Score
1	78
2	80
3	69
4	54
5	63
6	65
7	71

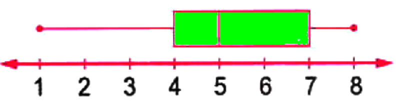
a 7   b 26   c 54   d 80





Homework

1. Complete the following.



a. In the opposite box plot , the range = ……………

b. If 50 is the greatest number of data set and the range = 10 , then the smallest number of this data set equals ……………

c. The balanced point of data set (7 , 8 , 10 , 10 , 11 , 12 , 12) is ……………

d. The mode of the following data set (4 , 7 , 4 , 6 , 4 , 9 , 4 , 11 , 7) is ……………

e. The greatest negative integer is ……………



[2] Choose the correct answer:

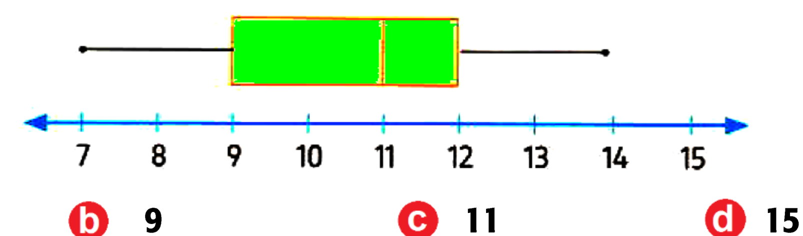
(1) The range of the set of values 7, 3 , 6 , 9 and 5 is….

ⓐ 2 ⓑ 3 ⓒ 4 ⓓ 6

(2) If the values of data set start from 10 to 35, then the range of this data =

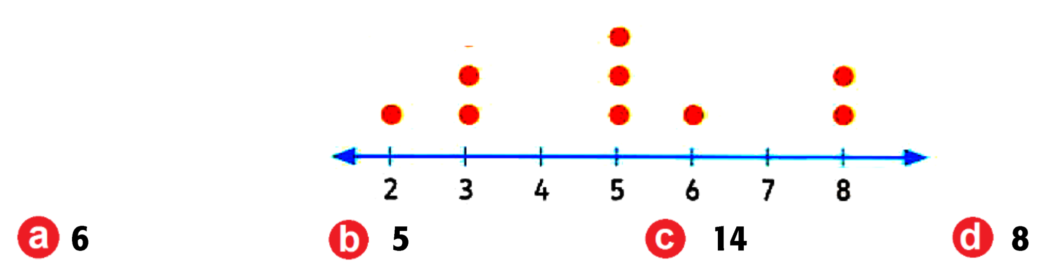
ⓐ 10 ⓑ 15 ⓒ 25 ⓓ 45

(3) By using the following box plot, the range = …..



ⓐ 7 ⓑ 9 ⓒ 11 ⓓ 15

(4) By using the following dot plot, the range = …..



ⓐ 6 ⓑ 5 ⓒ 14 ⓓ 8

(5) The range of the numbers 19, 14, 9 and 2 is ………….

ⓐ 2 ⓑ 9 ⓒ 14 ⓓ 17

Unit (7) Assessment

[1] Choose the correct answer:

1. The mean of the data set {9 , 19 , 12 , 10} is ....

   A. 10 B. 12 C. 12.5 D. 15.5

2. The balance of the following data set 17 , 18 , 20 , 20 , 20 , 21 , 21 , 21 , 22 is ....

   A. 18 B. 20 C. 20.5 D. 21

3. The mode of 7 , 9 , 7 , 8 , 7 , 6 , 7 , 10 is ....

   A. 7 B. 8 C. 9 D. 10

4. The better measure of central tendency for the following data set is ....

   A. mean B. median
   C. either

5. The outlier value of the following data set is ....

    25 27 24 94 21 22 26

   A. 21 B. 27 C. 49 D. 94

6. What is the range of the following data set ?

   3 4 5 6 7 8

   A. 4 B. 3
   C. 5 D. 7

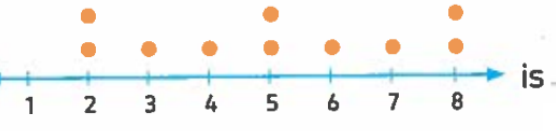
7. The range of the set of values 9 , 4 , 6 , 1 , 7 is ....

   A. 9 B. 8 C. 7 D. 6



[2] Complete:

1. The .... = the greatest value – the smallest value.
2. .... is the middle value of the data set
3. The values that lie outside most of the other values in a set of data called ....
4. The mode of 6 , 4 , 2 , 9 , 4 , 3 , 7 , 6 , 4 , 5 , 4 is ....
5. The average of 3 , 4 , 6 , 6 , 7 , 8 , 8 is ....
6. The median of the following data which is represented by the dot plot

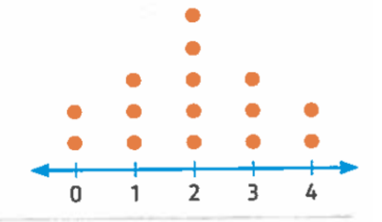
   is ....



[3] Find:

Answer the following :

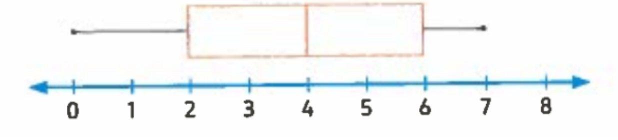
1. By using the opposite dot plot find :



   a. The mean b. The median
   c. The mode d. The range

2. Wael runs 3 km on Saturday, 5 km on Sunday, 4 km on Monday, and 4 km on Tuesday. Find the mean distance covered by Wael.

3. Sameh drew a box plot to show the number of times that students play music last month. What is the range of the number of times play music.

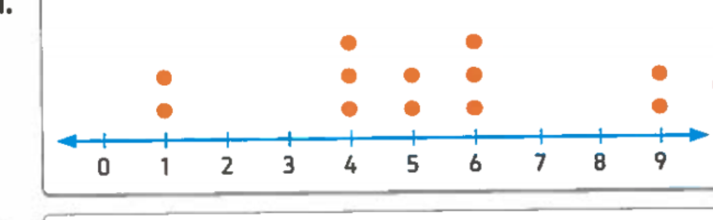




Choose the suitable descriptions with the related graph about the effect of outliers on the mean.

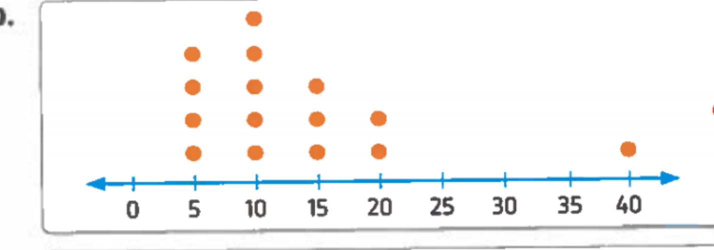


a.



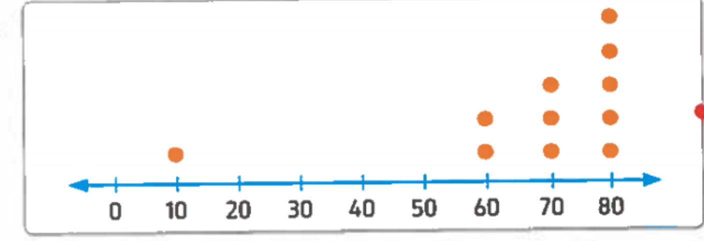
Mean increases

b.



Mean decreases

c.



Mean stay the same



Best Wishes